# INDEX

# Canadian Mining Journal, Vol. 34

*JANUARY 1st, 1913 TO DECEMBER 31st, 1913*

MINES PUBLISHING CO., LIMITED

44-46 Lombard Street

TORONTO

# The Canadian Mining Journal

(With which is incorporated "The Canadian Mining Review.")

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## A Journal Devoted to Mining and Metallurgy

Published on the First and Fifteenth of each month

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# INDEX

## CANADIAN MINING JOURNAL. VOL. 34

### JANUARY 1, 1913, TO DECEMBER 31, 1913



*Illustrated. E. Editorial.

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# THE CANADIAN MINING JOURNAL

VOL. 34 TORONTO No. 1

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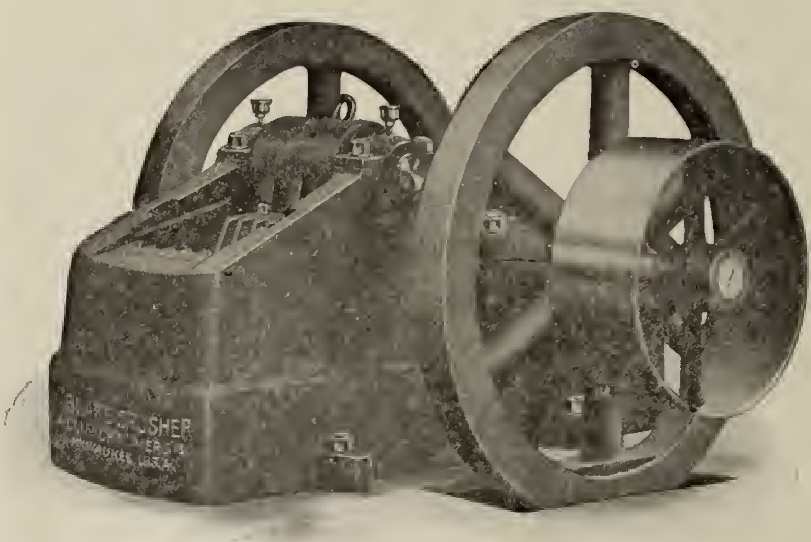

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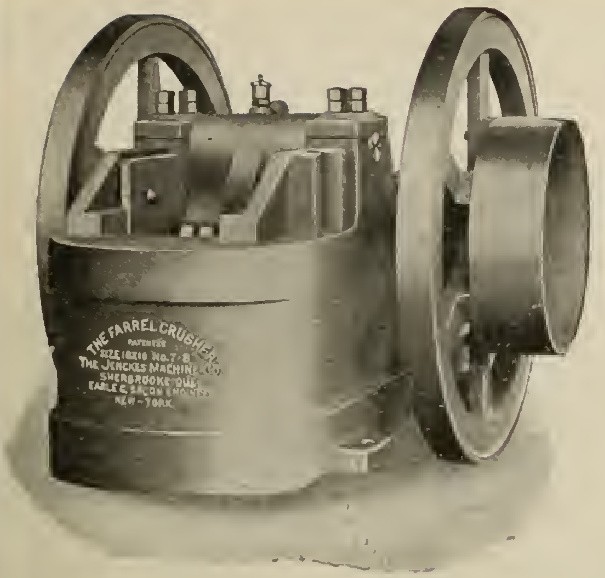


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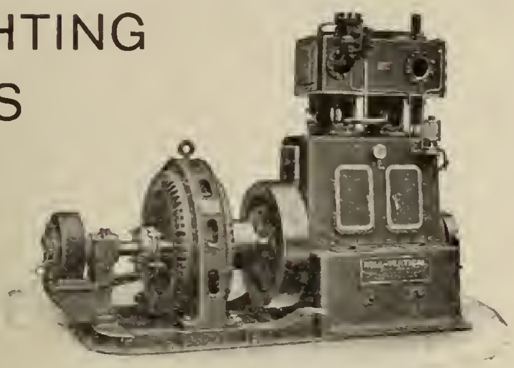

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34-5

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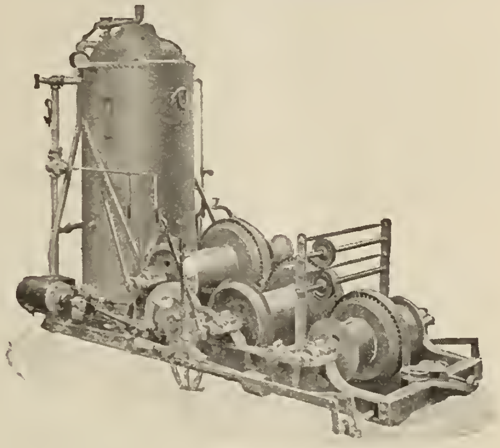

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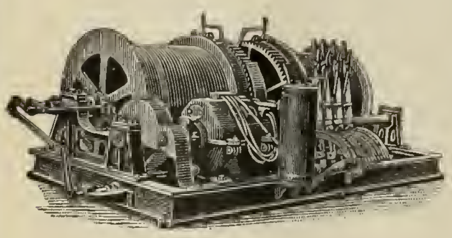

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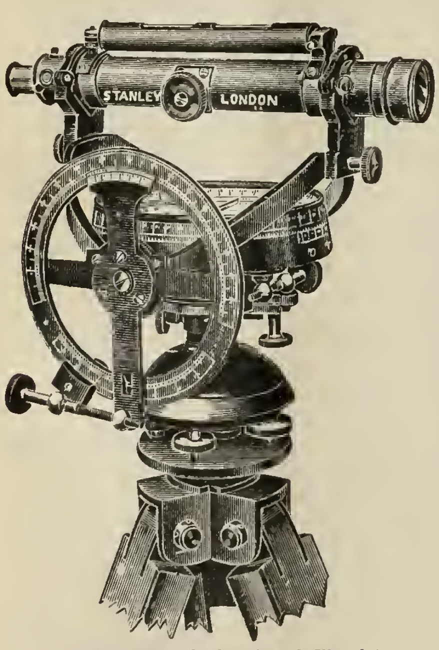


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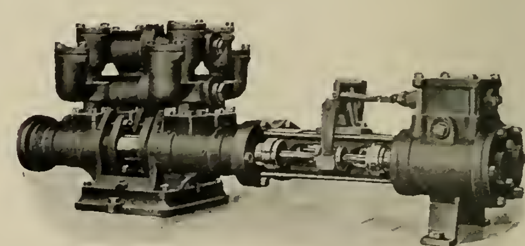

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| Total cost of steel wasted - | $1.50 |
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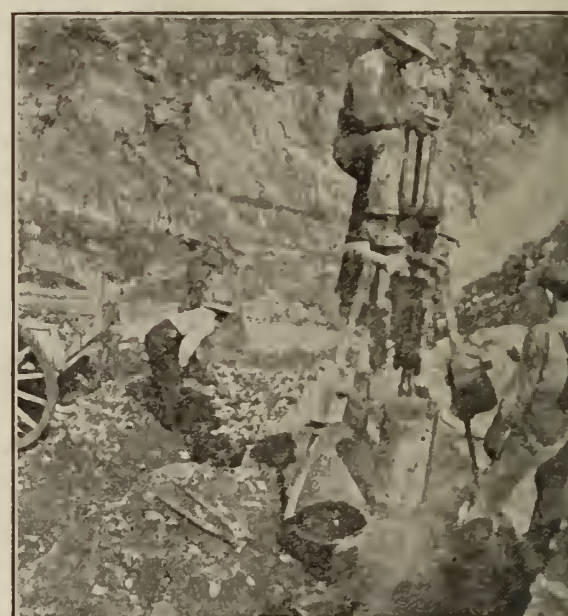

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# The Canadian Mining Journal

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879.'

CONTENTS.



## A HAPPY NEW YEAR

**For our subscribers, our contributors, our advertisers, and for the whole brotherhood of mining we wish a Happy and Prosperious New Year. May every legitimate ambition be fulfilled, may peace reign privately and publicly, and may all and sundry conspire to work out manfully the destiny of Empire and Nation.**

## THE YEAR 1912—A REVIEW

Attempting the role of prophet is dangerous. Twelve months ago, in estimating the probable total value of Canada's mineral output for the year 1911, we exceeded the mark by some millions of dollars. There was, however, some excuse for this. Labour troubles in the West, the re-organization of Amalgamated Asbestos, and other such incidents cut down the gross mineral production.

Despite our previous over-estimate, we venture now to assert that for the year that has just closed there will be recorded a considerably higher total value for the product of mine and smelter. The following paragraph will develop our reasons for so thinking:

**Nova Scotia.**—Once again has our easternmost Province exceeded all previous records in coal production. Actual figures are, of course, not yet available. But the increase has been considerable. The Springhill collieries, under the management of the Dominion Coal Company, have contributed steadily. Both the Dominion Coal Company's and the Nova Scotia Steel & Coal Company's Cape Breton collieries have yielded many thousands of tons more than during 1911. The former company's outputs are greater by at least half a million tons; the latter, by about sixty thousand tons. Except in the case of Springhill, where the output has been brought up by more than one hundred and fifty thousand tons, other changes of figures are mostly light recessions.

While the gold yield has presumably stood still, the fact remains that several important negotiations are pending that will, we hope, do justice to the real possibilities of the Province's extensive and largely improved gold fields.

Gypsum quarrying has been active. There is reason to believe (and here we quote from semi-official advices) that the shipments have been of greater bulk than before.

Manganese mining, though still carried on in a small way, shows signs of strength. Iron ore mining and concentrating have been established and will prosper. Other mineral industries are still awaiting intelligent exploitation.

The iron smelting and steel plants of Nova Scotia have had a good year. New equipment and a strong market have combined to keep up a more than normal pressure. The certain inception of a shipbuilding industry will warrant gradual expansion.

**New Brunswick.**—Only in a mild wiy is New Brunswick a mining Province. The iron property of the Canada Iron Corporation near Bathurst is equipped and producing. Gypsum is quarried in the southern part of the Province. Apart from these two industries the principal activities are the development of the most important gas and oil fields near Moncton, and the projected exploitation of the oil shales in and about the same district. New Brunswick possesses known deposits of antimony, copper, tungsten, gold, and coal. But there has been practically no effort made by the Provincial Government to advertise its resources. The Government includes no organized Department of Mines, and is, apparently, content to drift along, year after year, in stolid indifference to the industry of mining.

. . **Quebec.**—Far otherwise is it with Quebec. The Government of that Province has for some years taken the keenest interest in the industry. The laws have been revised and altered. The prospector has been encouraged, excellent annual reports are issued, and every encouragement is offered to the investor.

Asbestos mining has been placed on a much better footing during the year. In fact it appears probable that this branch of the industry has recovered from its late indisposition. Copper mining, or, rather, the mining of copper-bearing iron pyrites, is progressing. Gold dredging in Beauce county is being actively carried on. Other minor industries, such as the mining or quarrying of magnesite slate, building stones, etc., are in good condition. The past year, indeed, has brought to Quebec a marked measure of prosperity.

**Ontario.**—The outstanding feature of the year in Ontario has been the increasing importance of gold mining in Porcupine. While Cobalt has preserved the even tenor of its way, while the copper-nickel industry at Copper Cliff has flourished and is about to be much enlarged, and while other branches of mining have been active, Porcupine has occupied the centre of the stage. With an output of gold for about six months of the past year approaching two million dollars, the product of less than one hundred stamps, Porcupine is assuredly making good. Before the end of 1913 there will be at least two hundred stamps dropping. It is within limits to estimate the probable output for 1913 at, say, five million dollars. It is impressive and encouraging to know that other camps, Swastika, Michipicoten, Rainy River, and Lake of the Woods, will add considerably to this total.

While Cobalt's production of silver is slightly lower for 1912 than for 1911, the higher price of silver brings the gross value up to a larger figure. The year was marked by several important discoveries, and by great activity in leasing old properties. Gowganda has more than held its own, despite the closing of the Millerett, and there are signs of life in the Elk Lake region.

Whilst it is impracticable here even to mention all the branches of active mining in Ontario, it is well to touch upon certain facts that have changed and improved the position of certain regions. The re-opening of the old Belmont iron mine in Eastern Ontario is at once significant and inspiring. The operating company is a strong Buffalo concern. If success crowns their efforts much good will follow for the whole district. Equally significant is the re-opening of the long-abandoned Cordova gold mine. And here we may remark that it would be well, indeed, if more mining investors took pains to look into the gold regions of Eastern Ontario.

Talc milling has attained the status of an established and growing industry, and the Canadian product has a world-wide market. The mining of iron pyrite is also advancing.

Looking westward, there is tangible evidence of growth in Michipicoten and in other parts.

**Alberta.**—It is most satisfactory to note that the sub-bituminous coal mines have had an exceedingly satisfactory year. So strong has the market been that these collieries have been quite unable to meet the demand for their product.

The danger of a fuel famine seems to be less imminent than before, although the situation is by no means free from adverse possibilities. Lack of transportation facilities is alone responsible for this. The actual coal output of the Province has gone up by leaps and bounds. For the year 1912 it will be practically double the output of 1911.

**British Columbia.**—Like Ontario, British Columbia has experienced a singularly prosperious year in mining. The tonnage of ore mined was much larger than that recorded for 1911, partly on account of the labour troubles of 1911, and partly on account of strong expansion. Copper was produced to the extent of fifty million pounds, as compared with thirty-eight million pounds in 1910. This constitutes a high record. Comparison with 1911 would be meaningless. Gold production was nearly at record figures. The silver yield was the highest in five years. Lead reached the total of thirty-five million tons, closely approximating the yield of 1910, and exceeding that of 1911 by about nine million pounds. During the greater part of the year, no bounty was paid on lead as the London price was above the bounty limit.

The production of zinc and iron was negligible.

Coal outputs were within comparatively few thousands of tons of the highest mark attained.

Taken as a whole, the year was easily the most profitable in the history of the Province. Dividends to the amount of $1,200,000 were paid by metalliferous mines for the first time in some years.

General.

**Technical Education.**—Since the report of the Royal Commission on Technical Education has not yet appeared, there has been little change in the established order of things. Amongst the most important incidents are the extension of the metallurgical department of Toronto University and the completion of the new mineralogical building, Nicol Hall, at Queen's University. The Commission's report is looked forward to with eagerness. It will probably appear early in January of this year.

**Legislation.**—Nothing of importance has been enacted in relation to mining either in the Dominion or the Provincial Legislatures. The draft of a general mining law, drawn up by a committee of the Canadian Mining Institute, is still in "statu quo ante bellum." Nor does there seem to be much hope that Parliament will discuss the matter this winter. Naval affairs will probably cause a pronounced congestion, and other matters will be neglected. Should this be the case, the Dominion Government will have been guilty of an obvious dereliction of duty.

The problem of workingmen's compensation has been discussed and reported upon in Ontario. The labour element has placed itself in an invidious position in its endeavours to organize a superfluous strike in Porcupine. It is a fact, a curious fact, that organized labour takes no steps to remedy evils. This is left to organized capital. The function of labour is apparently the black-mailings of the capitalist after he is committed to definite investment. It is just here that our laws are constructively deficient. If the Conciliation Act means anything it implies that a means is provided whereby differences as between employer and employee may be reconciled without recourse to the crude strike. Of late, the Act has been a dead letter. It has been used only when it suited the purposes of one or of both parties. It has never been a binding obligation upon either. In fact, it has resolved itself into a subterfuge rather than a remedy. That it should be the latter, no one will dispute. The difficulty lies, we think, in inducing employers to present the whole situation completely and sanely. As has been said frequently in these columns, the interests of employer and employee are ultimately identical.

**Departmental.**—In our next issue will appear complete accounts of the work of each Dominion and Provincial Department of Mines for the past year. Here we may be permitted to remark that only Nova Scotia, Quebec, Ontario, and British Columbia have adequate Departments. New Brunswick, Manitoba, Alberta, and Saskatchewan are entirely neglectful of the mining industry.

While the Dominion Government has not yet seen fit to erect a separate Department of Mining, there is hope that this will be done in the near future. The futile policy of tacking mining on to another Department as an adjunct should have been outgrown long ago.

**The Canadian Mining Institute.**—Harmony reigns in the Institute. Possibly too much harmony. We are neither anarchists nor disturbers of the peace. But we are firm believers in the moral value of an occasional disturbance. However, there does not appear to be a cloud of even the size of a man's hand upon the horizon. Yet our trust is in the membership of the Institute. We know perfectly well, that some kicker will arise before the next Annual Meeting. And we will trust to him to make an interesting cloud of dust.

**The Profession.**—A year ago we remarked that Canada had become the "popular hunting-ground for many mining engineers from foreign parts." This is yet true. It is is also true that Montreal, Toronto, Calgary, and Vancouver have had the names of many mining engineers added to their directorate during 1912. The two former cities are liberally supplied with mining talent. Most of the new arrivals, fortunately, have specific connections where with to occupy themselves. Otherwise Canada is hardly a promising field. The consulting engineer, sad to state, has not yet an established hold upon the Canadian public. Time will cure this condition.

**Opportunities.**—In drawing attention to mining opportunities in Canada there is every chance of being over-enthusiastic. Therefore it may be pursuing the safest course merely to point out the fact that in every mining Province, and in many unsuspected regions, there exist excellent chances forthe mining investor. It is necessary, however, to be fully seized of the fact that it requires money to find what is wanted. It is useless, for instance, to begin prospecting unless the prospector is provided with ample means to test his territory. Moreover, it is futile to break into the game at all without having the wherewithal to carry it to a definite conclusion. Foreign investors are singularly obtuse, almost as obtuse as the native variety. But history is being made. Canada is yet in its swaddling clothes as a mining country.

. . . . . .

The year 1913 should be one of monumental progress for the mining industry of Canada. Everything points to continued expansion. The past year has been wonderfully encouraging. This year, we believe, will be even more so.

## EDITORIAL NOTES

Satisfactory preliminary reports from Quebec and British Columbia are printed in this issue of the Canadian Mining Journal. More complete reports from each Province will appear on January 15th.

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The Hawthorne trial, for which a number of Canadian witnesses have been called, may be brought to a conclusion some time in January. United States procedure is singularly complicated and slow. But the tangled skein is almost straightened out. Many picturesque aspects of the promoting game have been revealed. While it is not yet proper to make final comment, it appears safe to assume that justice will be meted out. Justice Hough, before whom the accused are being tried, is the official who sentenced Morse, the "Ice King," to penitentiary some years ago.

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Dr. J. Austin Bancroft, of the Geological Department, McGill University, has reported upon the alleged discovery of diamonds near Matagami lake. The blue clays, according to Dr. Bancroft, are merely deposits of aqueous origin, and have not been derived from the communication of basic igneous rocks. He holds out no hope of existence of diamantiferous ground in the region.

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Erroneous press despatches in connection with the Hawthorne trial have confounded the identities of Dr. Robert Bell, late acting-Director of the Geological Survey, and Mr. J. McIntosh Bell, mining geologist and engineer to Messrs. Ehrlich & Company, London, England. Mr. J. McIntosh Bell had no connection, either directly or indirectly, with the Hawthorne matter.

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The insinuating oil promoter spares no pains. Not content with ordinary channels, an English firm of alleged bankers, Hatton, Morris & Co., inserts in the November Strand magazine (English edition) a dodger offering free 5 per cent. income certificates and a large amount of cash. The company owns, or pretends to own, 1,300 acres of oil lands. That is the only fact that can be gathered from the dodger. Readers of the Strand are invited to send in their names. "If you receive no reply you will understand that the whole of this wonderful cash and bonus offer has been over applied for." Just so! And the Strand allows its pages to be dirtied with this nonsense!

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## HOW TO TEST FOR FIREDAMP.

Acting on the recommendation of the chief inspector of mines for the province (Mr. Thomas Graham), Sir Richard McBride, premier and minister of mines for British Columbia, has had distributed among a number of men connected with coal mining in the province a pocket folding card on which has been printed brief instructions "How to Test for Firedamp," as follows:

"To test for firedamp the flame of the ordinary miner's safety lamp must be carefully turned down until only a faint line of blue is seen over the yellow eye or centre, as shown in the illustration.

"The presence of firedamp in the air is indicated by a pale triangular form—common called a 'cap'—which appears over the top of the blue line, varying in size and intensity according to the amount of firedamp. The 'cap' begins to appear when there is about one per cent. of firedamp, and if there is less than two per cent., only the lower part of the 'cap' can be clearly distinguished; but when the amount is about two per cent. the whole of the 'cap,' including the tip, is visible, though, as shown in Fig. 2, it is very faint. The greater the amount of firedamp present, the plainer becomes the 'cap.' With three per cent. (Fig. 4) it is longer as well as more distinct, and with higher percentages the 'cap' extends up into the lamp chimney.

"In testing for small percentages of firedamp, mistakes may easily arise unless the observer makes himself quite familiar with the appearance of the lowered flame as seen in the pure air of an intake road. If there is any petroleum spirit in the oil, particularly if the metal of the lamp is wet with it, a faint 'cap,' called a 'fuel cap' or 'oil cap' is sometimes seen, but by carefully examining the appearance of the lamp in places where the air contains no gas, one can readily learn to distinguish the 'fuel cap' from the 'firedamp cap.'

"If a complete 'cap' (such as is shown in Fig. 2) however faint, is visible on the lowered flame, men should withdraw at once from the working place, and inform the fireman or other official responsible for the ventilation."

The illustrations, which it is not practicable to reproduce here, show clearly the 'cap' mentioned, in several stages. The card is issued by the British Home Office; it can be purchased from Old Country booksellers at the price of three cents.

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## ELECTRIC SAFETY LAMPS IN COAL MINES.

Both the British and German Governments are offering prizes for miners' electric lamps suitable for practical use and provided with a reliable fire-damp indicator. A condition of the German competition is that both the lamp and the indicator shall be safe in presence of firedamp, even if damaged, and must be capable of continuous service for at least 12 consecutive hours. The lamps must be handy, durable, simple in construction, capable of being securely fastened, easily attended, and economical in use. The indicator must be at least equal to the benzine safety lamp in sensitiveness to methane and foul air. After burning 12 hours, muststill give a light equal to 1 Hefner unit. The prize offered is 25,000 marks.

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## A FEDERAL MINING LAW.

Dr. R. W. Brock, director of the Geological Survey of Canada, included the following comment on a proposed Federal mining law in the recently-issued "Summary Report" for 1911: "The Canadian Mining Institute for some years has been urging a Federal mining law to govern the acquisition of mining rights on lands under the control of the Dominion Government, on the grounds that the industry has now attained an importance deserving this recognition, and that a law would greatly stimulate the development of the mineral resources on Crown lands. It is also believed that the provinces having control of mining lands will make their mining laws conform closely to the Federal law, and thus secure, throughout the Dominion, uniformity in the mode of dealing with mining rights. At the suggestion of the Government, the Institute formulated the principles upon which it desired the law to be based. Mr. J. M. Clark was engaged to draft an Act based on these principles. Subsequently, Mr. F. T. Congdon and the Director of the Survey, were requested by the Committee on Mining Law of the Institute, to revise this draft. After spending several months on the work they submitted a new draft which, with a few minor changes, has been accepted and recommended to the Government by the Canadian Mining Institute."

# THE MINING INDUSTRY IN THE PROVINCE OF QUEBEC DURING, 1911.

T. C. Denis.*

By far the greater proportion of the mineral production of the Province of Quebec is derived from non-metallic products. In fact, during the year 1911, the metal mines contributed but 3 per cent. to the total yearly mineral production of Quebec. This is very low and liable to give a false impression of the possibilities of our metalliferous resources. This low metallic output is not necessarily a matter for discouragement, for if we consider our sister province Ontario, we see that over 50 per cent. of the value of its total mineral production is extracted from two fields, which are only a few square miles in area, viz., silver from Cobalt, and nickel from Sudbury. In the immense territory which constitutes the province of Quebec, the greater part of which is practically untouched, there are numerous bands of rocks similar to those which have given rise to the celebrated metal mines of Ontario, and the presence of such deposits may be revealed at any time in our province.

According to the Mining Laws of the province of Quebec, the operators of mines and quarries are required to make returns of their production in the first ten days of January of each year. It is, therefore, impossible, at this early date, to give more than surmises as to the mineral production for 1912.

In 1911, the total value of the products of mines and quarries of the province of Quebec amounted to $8,679,786, and from all appearances, there will be a substantial increase in 1912.

After having passed through a rather critical period of two years, owing to over-production and glutting of the market, the asbestos industry is gradually resuming a normal state. At present, there appears to be a greater demand for the long fibre qualities and prices for grades of $60 and over are satisfactory. The prices for lower grades, however, are still below normal, and are not remunerative.

In consequence, only the mines which can produce a certain proportion of good fibre were operated during the year. In Thetford and Black Lake, great activity ruled during all summer and fall, and some difficulty was experienced in getting the necessary labour. All of the East Broughton mines were closed down, as the rock in that field is essentially milling rock and the fibre is short.

In 1911, the shipments of asbestos amounted to a value of over $3,000,000. The shipments of asbestos over the Q.C.R. for the first nine months of 1912 showed an increase in tonnage of some 12½ per cent., as compared with the corresponding period of 1911. From this it may be augured that, in spite of the closing down of the East Broughton mines, the value of the asbestos production for 1912 will be higher than in 1911.

The increase in the price of copper caused a renewal of interest in the Eastern Townships deposits of this metal. However, only two mines shipped ore; the McDonald mine and the Eustis mine.

The McDonald mine at Weedon is operated by the East Canada Smelting Company. It was in very active operation all year. During the early part of the year when the ore had to be teamed six miles to the railway, the shipments were at the rate of 2,000 tons a month. In the spring, this progressive company installed an aerial tramway, four miles long, of a capacity of 200 tons per 10 hours, which decreased the cost of hauling to about one-tenth, and the shipments for the last six months have increased tremendously. The development is kept well ahead of mining and they have a good reserve of ore blocked out.

The ore is a pyritous copper ore, running 40 to 45 per cent. sulphur, and averaging 4 per cent copper, some shoots of ore running much higher. The sulphur contents is used for the manufacture of sulphuric acid and the copper is extracted from the cinders.

The Eustis mine worked without interruption and also greatly benefitted from the improved conditions of the copper market. The ore there is of the same nature as at the McDonald mine, the deposit and mode of occurrence being similar.

It is very likely that the Eustis Mining Company will shortly install an Elmore oil concentrator to relieve their present mill.

Considerable work was carried on in re-opening the old Ives mine and the Huntingdon mine, both on the Eastman branch of the Canadian Pacific Railway. At the Huntingdon, a concentrating mill is being installed. No shipments were made from either of these two mines.

On Calumet Island, work was carried on, interruptedly, re-opening the old lead and zinc mines. A concentrating mill of a capacity of 150 tons a day has been built, but very little has been spent in development proportionately to the cost of surface construction.

At Notre Dame des Anges, in Portneuf county, a great deal of work was done on the lead and zinc deposits mentioned last year. The ore is found in a contact zone of crystalline magnesian limestone, which in places is strongly impregnated with zinc blende and galena. This zone, in places, is quite wide, forty feet or more, and it has been followed by trenching and outcrops for half a mile or more. A concentrating mill was built during the summer, but could not be completed to start operating this year.

The production of gold is still confined to the operations of the Champs d'Or Rigaud-Vaudreuil Company, near Beauceville, and to the gold contents of the pyritous ores of the Sherbrooke district. Although considerably larger than last year, the gold production will not probably be as high as was anticipated. There is no doubt, however, that the alluvial gold industry in Beauce will henceforth grow and improve yearly.

Discoveries of lode gold were reported from Lake Kinawisik, in Northwestern Quebec, in narrow quartz stringers.

No actual mining operations were carried on in the chromite deposits, but the Black Lake Consolidated did some exploratory work and diamond drilling, which are said to have given satisfactory results.

The graphite industry received quite a setback by the closing down of the Dominion Graphite mine and mill, of Buckingham, but this was offset to some extent by the uninterrupted operations of the Bell Graphite Company and by the work of a new company, the Quebec Graphite Company, in which it is said German capital is interested.

*Superintendent of Mines, Mines Branch, Quebec.

**Beauce Hydraulic Co.**

The prices ruling for mica were improved, and it is probable that the shipments will show a substantial increase over last year.

The general development of the province, and the growth of the urban centres will certainly be reflected in the figures of the building materials industry. The demand for building and ornamental stone has been very active. As an instance, two new marble quarries

**Dominion Marble Quarry, South Stukely, Quebec**

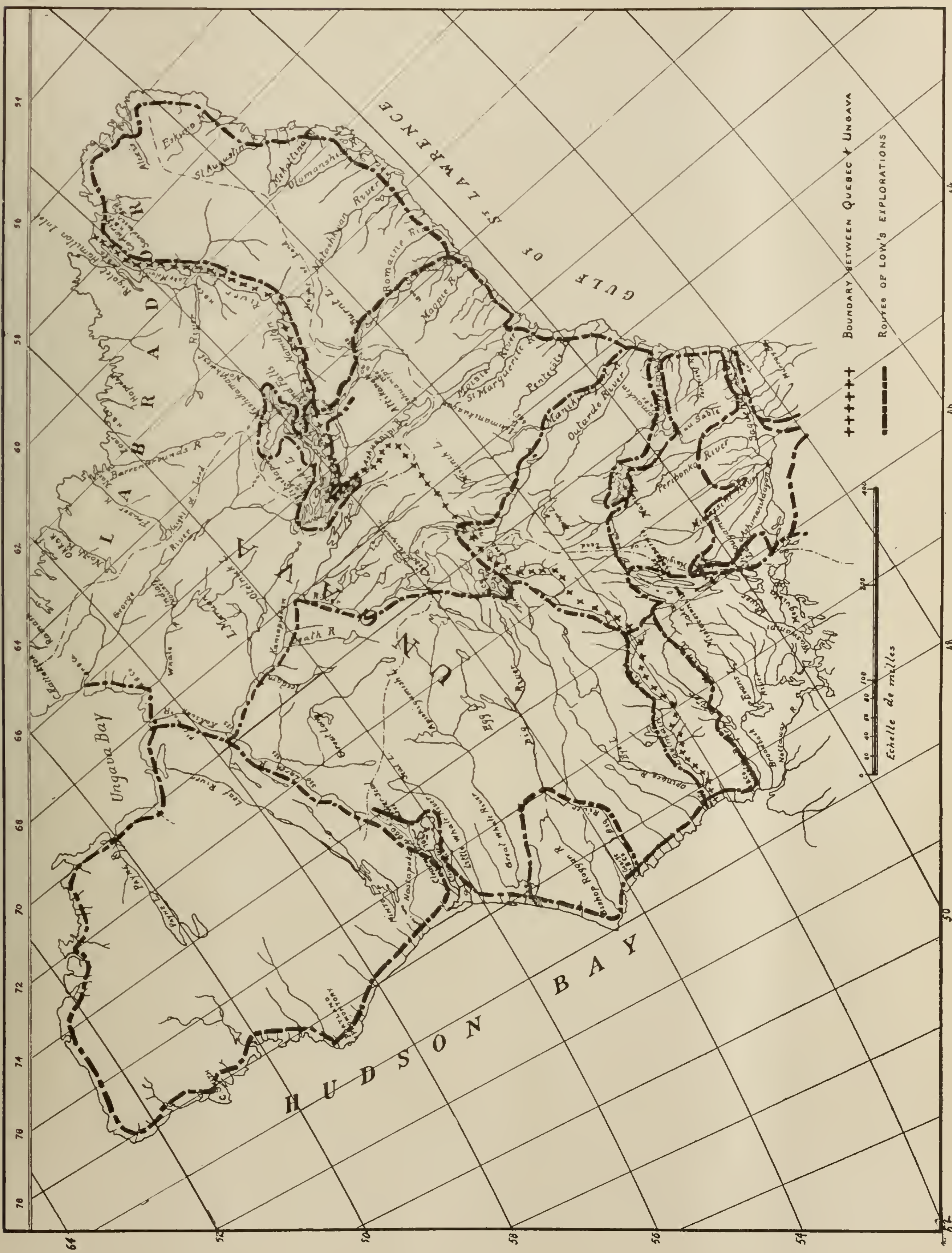
were opened this year and although no shipments from these were made, it is expected that, in 1913, they will be in shape to produce. One of these quarries is situated near Portage du Fort, in the Upper Ottawa region, and the other at St. Theele, Champlain county. Both the Missisquoi Marble Company and the Dominion Marble Company, operating at Phillipsburg and South Stukely, respectively, have had a very successful year. Their products are in every way equal to the best foreign marbles.

The production of peat in the province of Quebec will probably amount to some 2,000 tons. Although small, it is the largest yearly production ever recorded. The Peat Industries, Limited, who have a modern plant installed at Ste. Brigitte, near Farnham, are responsible for the whole production.

**View of Missisquoi Marble Quarry**

In May, 1912, the boundaries of the province of Quebec were extended northward by the annexation of Ungava, and at the last session of the Quebec Legislature, this territory was officially erected under the name of New Quebec. This extension of boundaries more than doubles the area of the province which now embraces a superficies of nearly 707,000 square miles.

This territory is yet very little known. From the ex-




QUEBEC ADDED TERRITORY

plorations which Mr. A. P. Low conducted for several years for the Geological Survey, it would appear to be underlain almost altogether by Archean rocks. The Laurentian formation of gneisses and granites occupy the largest portion of it, but the presence of large tracts of Huronian and Keewatin rocks have been observed and these can be regarded as offering great possibilities from the mineral standpoint.

# MINERAL PRODUCTION OF BRITISH COLUMBIA, 1912.

By E. Jacobs.

A rough estimate of the quantity of ore produced in 1912 places it at 2,600,000 tons, which is 400,000 tons higher than that of 1910, previously the record year. More than two-thirds of this production was from the copper mines of the Granby and British Columbia Copper companies.

In quantities of minerals produced, as compared with 1910 (labor difficulties so interfered with the 1911 production that comparison with that year would not fairly indicate last pear's progress, but show it to too great an advantage) there was an increase in all but gold and coal, and it is probable that revised returns will show a close approach to record figures in these. The chief increase was in copper—a production of approximately 50,000,000 pounds as compared with 38,000,000 pounds in 1910. Of course, the substantial increase in 1912 as compared with 1910 in average price of copper, and in smaller degree of silver, added materially to the year's increase in total value of production.

**Gold.**—Preliminary returns show a smaller production of gold than has been expected, as to both placer and lode gold. The 1911 yield of placer gold was the lowest in seventeen years; while that for 1912 gives an increase of about 3,500 ounces, it is much less than was expected. Atlin district is highest, with an estimated yield of $260,000, and Cariboo next with $200,000. All other parts of the province are put down at $15,000. Revised returns may show higher results in both Atlin and Cariboo. The total value is estimated at $485,000 as against $426,000 in 1911.

Boundary district, including Hedley camp, Similkameen, appears to have made a net increase in lode gold of 15,000 ounces, and Nelson about 3,000 ounces. Rossland production will probably be found to have been about the same as in 1911, while the Coast district is expected to show a decrease. The total production is estimated at 250,000 ounces, as compared with 268,000 in 19100.

**Silver.**—The output of silver, placed at 2,700,000 ounces, is the highest in five years, 1908-1912. Final returns are expected to show a higher total, but available figures suggest the foregoing quantity as a safe estimate. Nearly one-half has come from Ainsworth-Slocan mines, while about 400,000 ounces is from Boundary district mines, in the ores of which both gold and silver are associated with copper, though the last is the chief metal of value. East Kootenay silver production is estimated at between 350,000 and 400,000 ounces, that of Coast mines at rather more than 100,000 ounces, and from Rossland about 90,000 ounces.

**Lead.**—A total of 35,000 pounds of lead seems to be a reasonable estimate. Lead contained in ores received at the Trail smeltery is estimated at about 44,000,000. The estimated production of metallic lead allows for a loss of 20 per cent. in smelting. Nearly one-third of the lead produced was from the Standard mine, Slocan, while the Sullivan, East Kootenay, contributed a similar proportion. The Van-Roi and Rambler-Cariboo, in Slocan district, and the Emerald, in Nelson mining division, were the chief of the smaller producers, which included some 20 mines in all.

Deep development work done at half a dozen Slocan mines that produced litle or no ore in 1912 gives promise of an appreciably large addition to production in 1913. To a smaller extent an increase from mines near Salmo, Nelson division, may be expected, while in the northern country now being opened by completion of part of the Grand Trunk Pacific railway, through Skeena district, developments at several new properties indicate an early commencement of production of silver-lead ores.

During seven months of 1912 the London price for lead was above £18, so no bounty was paid by the Dominion Government in that period under the "Lead Bounty Act." About $65,000 was paid as bounty on lead in ore mined during the first five months of the year. Approximately $700,000 of the original amount of $2,500,000 voted under the "Lead Bounty Act" ten years ago remains unearned. Under the present Act, payment of bounty will "cease and determine on June 30, 1913."

**Copper.**—The year's production of copper, placed at 500,000,000 pounds, is without question the largest in any year in the history of copper mining in the province. Comparison with the records of 1908 and 1909 will not correctly show the increase in actual production, for some earlier figures represent the copper contents of the ore, while those for 1912 give the estimate of copper recovered.

A glance at the figures of the few larger mines will show that the above-given estimate is well based. For instance, Granby Company's ore output was more than 1,200,000 tons; at 18 pounds of copper to a ton recovered, 22,000,000 pounds is accounted for. British Columbia Copper Company (including New Dominion) mines made an output of about 620,000 tons of ore; at only 16 pounds of copper to the ton, approximately 10,000,000 pounds is also accounted for. Coast mines are officially stated to have recovered fully 15,500,000 lbs., while Rossland mines are credited with 2,500,000 pounds. At 16 cents a pounds (the average will be a fraction higher), the value of the year's output is within the mark at $8,000,000, which for actual production of copper, constitutes a record year for this metal.

**Zinc and Iron.**—An estimate of the crude zinc ore shipped gives a total of less than 3,000 tons, and of silver-zinc concentrate between 5,000 and 6,000 tons. The chief shipping mines are all situated in Slocan district; crude ore was shipped from the Lucky Jim and Noble Five, and concentrate from the Standard and Van-Roi. Beer, Sondheimer & Company, with works at Bartlesville, Oklahoma, through their agent, Mr. J. L. Retallack, have purchased the zinc output of the Standard, Van-Roi, Hewitt (Silverton Mines, Limited), and Monarch.

The French process for the reduction of lead-zinc ores, concerning which much was heard about a year ago, has not yet been advanced beyond the experimental stage.

While the development of deposits of iron ore on Vancouver island has continued, there was little, if any, production of iron in the province in a commercial way.

**Coal and Coke.**—The total production of coal was approximately 3,040,000 long tons gross or, deducting that made into coke, about 2,645,000 tons. The highest previous year's output was in 1910 with 3,139,000 tons gross and 2,800,000 tons net. The output of coke was 263,000 tons, with a single exception,( that of 271,000 tons in 1908), the greatest quantity yet produced in the province in one year. Labour troubles at two of the Vancouver island collieries interfered somewhat with production otherwise the total would easily have been higher than that of any other year. Vancouver island mines produced about 1,553,000 long tons of coal, gross; Nicola valley and Similkameen 191,500 and Crow's Nest Pass 1,296,000 tons. All the coke was produced in the Crow's Nest district, Southeast Kootenay. Three new mines are being opened on Vancouver island.

The new field—Groundhog—in which anthracite coal is stated to occur, situated in the northern Skeena country, was further explored, but it is without transportation facilities, so no production was made there.

**Miscellaneous.**—Platinum in Nelson mining division appears to still be a "will o' the wisp." No important progress has been made towards commercial production of this mineral. Gypsum deposits are being utilized. The demand for Portland cement has been in excess of existing manufacturing facilities in the province, so much has been imported. Output of building stone, clay products, etc., was larger than in any earlier year.

**General.**—On the whole, the year was the best in the history of mining in the province, and the outlook is for still further improvement. For the first time for a number of years companies operating metalliferous mines in British Columbia paid dividends aggregating nearly $1,200,000. These were the Hedley Gold Mining Company, Consolidated Mining & Smelting Company, Standard Silver-Lead Mining Company, British Columbia Copper Company, and Le Roi No. 2, Limited. In addition, the Granby Company made nearly $1,500,000 net profit in 1912. Important development work is being done and mine equipment is now such that increased production is confidently looked for.

### Metallurgical Notes.

The quantity of ore and concentrate smelted at the Consolidated Mining & Smelting Company's works at Trail was between 300,000 and 320,000 tons, which was less than in the fiscal year to June 30, 1910 (487,000 tons) also than in the next following fiscal year (389,000 tons). The decrease was caused by the loss of the Snowshoe ore, of which there was 268,000 tons received in the two fiscal years just quoted. Improvements included an addition to flue chamber, to secure better results in settling of flue dust from copper ores; rebuilding of matte-handling plant, method of treating low-grade matte having been changed; alteration to lead-sampling plant, made necessary by increase in quantity of coarse lead ore received; more electrolytic tanks in lead refinery, to provide for larger output of refined lead; and numerous other changes, chiefly to facilitate handling materials. Experiments in reduction of zinc-lead ores were carried out, but no provision was made for production of spelter on a commercial scale.

The chief change at the Granby Consolidated M. S. & P. Company's smeltery was in the substitution of water-granulation blast furnace slag for dumping it molten. By a system of conveying belts operated by electric motors, the dewatered slag is conveyed up a long incline to a height of 120 feet and then discharged, this arrangement providing room for all slag that will be made here for six or seven years. The quantity of Granby mines ore treated at these works in 1912 was more than 1,200,000 tons. One notable feature of the year's work was that the full battery of eight blast furnaces was operated all the year, one run having been for 156 or 157 consecutive days—from June 5 to November 9—without interruption. The Granby company is purchasing materials and plant and other equipment for a 2,000-ton smeltery, hydro-electric power station, railway, shipping dock, etc., at Granby bay Observatory inlet where its new copper mine is being developed with much assurance of large productiveness.

The British Columbia Copper Company operated its smeltery throughout the year. Ore receipts totalled between 650,000 and 700,000 tons. Much efficiency was secured, monthly totals of ore smelted having ranged up to as high as 65,000 tons, with three furnaces in blast. The greater part of the ores smelted came from the Mother Lode and Rawhide mines. There is in the company's Lone Star mine a large quantity of ore available, but owing to its high silica content concentration tests have been carried out with the object of determining how best to eliminate the excess of silica. This problem is now in a fair way towards being successfully solved.

Most of the copper ore and concentrate shipped from Coast district mines was treated at the smelting works at Tacoma, Washington. This includes the comparatively large output from the Britannia mine.

**Gold Milling.**—The largest stamp mill in operation in 1912 was that of the Hedley Gold Mining Company, at Hedley, Similkameen, at which about 70,000 tons of ore was crushed, as compared with 58,000 tons in 1911. Approximate value of gold recovered in 1912 was $760,000, as against $680,000 in 1911.

There were three stamp mills in operation in Nelson mining division in 1912. No information has been received concerning the Granite-Poorman and Queen mills, but the Motherlode Sheep Creek Mining Company's mill was worked during the latter half of the year. A new installation was that of a 10-stamp mill at the Inland Empire mine, west of Rossland camp. The Jewel 15-stamp mill was also running late in the year.

**Lead and Zinc Ore Concentration.**—The mills that made the largest output from concentration of lead and zinc ores were those of the Standard, Van-Roi, and Bluebell mines, respectively. The Rambler-Cariboo mill was started in December. The expectation is that in 1913 there will be several other concentrators in operation, with a proportionately increased output of both silver-lead and silver-zinc concentrates.

# THE PRODUCTION OF AVAILABLE POTASH FROM THE NATURAL SILICITES.*

By Allerton S. Cushman, Ph.D., Member of the Institute, and George W. Coggeshall, Washington, D.C.

The great demand which has recently arisen for an American supply of potash in available form for agriculture has stimulated not only the search for new sources of this material, but also experiments of a large and practical scale of operation, in the attempt to develop a method of making the vast supply of potash locked up in feldspars and feldspathic rocks either directly water-soluble or sufficiently soluble in dilute acids to insure a product which shall be useful as a fertilizer. The natural silicites commercially available as sources of potash are chiefly orthoclase and leucite. Both of these minerals are potassium-aluminum silicates. The theoretical formula for orthoclase is written $K_2O.Al_2O_36SiO_2$, and for leucite $K_2O.Al_2O_3.4SiO_2$. The principal sodium feldspar albite has the theoretical formula: $Na_2O.Al_2O_36SiO_2$. It is well known that these feldspars run into and substitute each other in various proportions, so that the products from different quarries will vary widely in respect to their soda and potash contents. There is an enormous supply of feldspar in the United States, both East and West, which could be made economicaly possible as a source of potash supply, provided the cost of production can be made low enough to compete with the potash-holding manure salts which are at present so largely imported from Germany. Although it must be admitted that the imported potash salts are richer in potash than any product that can ever be made from American feldspars, it should also remembered that the crude German manure salts contain large quantities of chloride and sulphates of elements which are not only undesirable in the fertilizer, but which may do actual harm under certain conditions. It is this fact which gives encouragement to the attempt to produce from American feldspars a straight potash fertilizer which could be used in exactly the same way that hardwood ashes have been found useful.

Six general methods have been proposed for decomposing the natural silicates, in the effort to obtain water-soluble potash salts.

### I. Adaptation of Natural Agencies.

In the processes of Nature, the slow action of moisture and atmospheric agencies, including the action of carbonic acid gas, is known to have a decomposing or kaolinizing action upon the feldspars. Immense deposits of feldspar and granitic rocks have thus been decomposed, with the formation of large beds of kaolin and clays from which the potash has been leached into the surrounding valley. For this reason, the valleys between feldspathic and granitic hills are usually highly productive of the crops which require large amounts of potash, such as tobacco, potatoes, large fruits, berries, etc. There have been a few processes proposed, which depend principally upon the natural reactions hastened by pressure and other agencies. In 1904, Blackmore (U.S. patent 772,206) proposed the action of carbon dioxide gas under five hundred pounds pressure upon a cream of the ground mineral, repeated intermittently for several hours, in the attempt to produce a yield of carbonate of potash. Ten years earlier the same experimenter (U. S. patent 513,001) had proposed using lime, calcium chloride, and steam pressure in an autoclave to produce chloride. In 1910, Coate (U.S. patent 947,795) proposed the addition of bacteria for the decomposition of feldspar. In 1910, Carpenter (U.S. patent 59,841) proposed to heat the mineral intensely and cool suddenly by plunging in water. in the effort to render the feldspar amporhous, in the hope of making it more available for plant growth. None of the above processes have as yet been shown to possess industrial possibilities.

### II. Wet Processes of a Chemical Nature.

Levi, in 1904 (French patent 344,246 and English patent 13,875), and Piva, in 1905 (French patent 351,-338), proposed methods ofr treating leucite by means of solutions of alkali or alkali earth hydrates, generally under increased pressure. The same general method for treating feldspar was claimed by Swayze in 1907 (U.S. patent 862,676) and by Giggs in 1906 (U.S. patent 910,662).

Also, Gibbs, in 1904 (U.S. patents 772,612 and 772,657), proposed a process of treatment with hydrofluosilicic acid, and subsequently with sulphuric acid, in order to produce potassium sulphate. In 1907, Cushman was granted U.S. patent 851,922, a public patent which proposed the sludging of finely-ground feldspar with water, the addition of a small amount of hydrofluoric acid, and electrolyzing the mixture in wooden cells provided with wooden diaphragms. Under this process both potassium and aluminum hydrate passed through the cell diaphragm into the cathode compartment. This process, although perfectly practical, has not yet been made commercially possible, owing to the high cost of hydrofluoric acid and the large amount of by-products formed in the process. None of the above processes have as yet been made commercial possibilities.

### III. Dry Processes of a Chemical Nature, in which the Potash Salts are Volatilized.

In processes of this nature, fluxes, and in some cases fuel, for reducing purposes are ground and mixed with the feldspar, the mixture being subsequently heated until the potash salts are volatilized and collected either in the stack dust or partially collected from the gases by passing them through or over water. Swayze, in 1905 (U.S. patent 789,074), heated ground feldspar with gypsum and carbon, and proposed to collect the volatilized sulphate. Spencer and Eckel, in 1909 (U.S. patent 912,266), made a cement mixed with calcareous and silicious fluxes and green sand, a natural potash-bearing iron silicate, clinkered the mixture in a rotary cement furnace, and obtained a Portland cement, at the same time collecting the potash in the stack dust and the flue gases. In 1911, Eckel (U.S. patent 1,011,-172) proposed a somewhat similar method, but heated only high enough to drive off the potash salts and not high enough to clinker the mixture. Again, in 1911, Eckel (U.S. patent 1,011,173) melted a mixture of green sand, limestone, and fuel, tapped off the melted iron and slag and recovered the potash salts from the flue gases.

Some of the processes under this heading have been tried on a large scale. No great difficulty is recorded in driving off the potash in the furnaces, but obstacles were encountered in the attempt to collect the potash from the gases. As a by-product operation in the

*Paper read at the Eighth International Congress of Applied Chemistry.

manufacture of cement, these processes may yet come to be of some industrial importance.

### IV. Dry Processes which Propose to Separate Potash as Hydroxide or Carbonate.

The old method of Bickell, proposed in 1856 (U.S. patent 16,111), which depended upon heating a mixture of feldspar, lime, and natural phosphate rock or guano to a bright red heat, has not as yet been proved practical or successful. The process of the Soc. Romana Solfati, in 1905 (French patent 352,275), which proposes the roasting of leucite with carbonate, hydrate, or nitrate of soda and lime, and subsequently the passage of steam through the roasted product to produce sodium aluminate and potassium carbonate, is possible from a chemical standpoint, but the high cost of operation has not permitted the process to come into commercial use.

### V. Dry Processes Producing the Chloride.

In 1900, Rhodin (U.S. patent 641,406) and in 1901 (J. Soc. Chem. Indus., xx., 439) proposed fritting feldspar with lime and salt. According to the published results, this experimenter obtained good yields, although the process has not become a commercial success. In 1907, McKee (U.S. patent 869,011) suggested heating a potash-bearing material containing mica with lime, salt, and carbon in order to obtain a yield of potassium chloride. Cushman, in 1911 (U.S. patent 987,436), proposed mixing feldspar with lime and salts of a mineral acid capable of decomposing the silicate, giving the mixture special treatment previous to heating in a rotary furnace in order to produce the chloride. This method has been tried out on a large mill scale of operation, and the results obtained will be discussed later on in this paper.

### VI. Dry Processes Producing Sulphates.

In 1911, Thompson (U.S. patent 995,105) proposed heating to a bright red heat mixture of feldspar, sodium acid sulphate, and sodium chloride, and subsequently leaching out the potassium sulphate produced. This experimenter claims that potassium chloride is first formed, which is subsequently changed to the sulphate by the action of the acid sulphate. It is stated that this process has recently been tried on a commercial scale of operation. Sodium acid sulphate is a by-product that is reasonably cheap, although a large quantity is not available. The lack of an abundnt supply of acid sulphite is perhps the greatest drawback to the commercializing on a large scale of this process, although it is possible that it may still become of some industrial importance. Hart, in 1911 (U.S. patent 997,671), proposed to fuse faldspar with some barium compound, such as the sulphate, together with carbon, to pulverize the cool melt, and subsequently to digest the product with sulphuric acid and thus produce in solution potash alum and a residue of barium sulphate and silica which is claimed to be useful as a paint pigment. Hart claims that some of the potash is volatilized during fusion. Since the fusion temperature is 1,500 deg. C., it is probable that a considerable portion of the potash does volatilize, and it is possible that this dufficulty may interfere with the commercial success of the process.

Wadman, in 1907 (U.S. patent 847,856), proposed heating lepidolite with potassium sulphate and leaching the product with sulphuric acid in order to obtain sulphates of lithium and potash.

A chronological list of the patents which have been granted for the treatment of the silicates for the production of available potash is given in Table. I.

It would appear that the most promising processes for making potash available from the natural silicates on a commercial scale of operation are those which are conducted in the dry way but without actual fusion of the reacting mixture. Potash salts volatilize readily at the high temperatures necessary for the fusion of the silicates, and the collection of the volatilized potash from the stack gas has not yet been carried out eco-

TABLE I.

**Proposed Extraction Processes Chronologically Arranged.**

| | Patentee. | Year. | Process. | Product. |
|---|---|---|---|---|
| IV | Bicknell | 1856 | Lime, $ca_3(PO_4)_2$ red heat | Caustic. |
| I | Blackmore | 1894 | Lime, powdered $CaCl_2$, $H_2O$, steam | KCl. |
| V | Rhodin | 1900 | Lime, salt, heat under melting | KCl. |
| II | Levi (leucite) | 1904 | $Ca(OH_2)$ or NaOH pressure 16 atmosphere | K silicate. |
| 11 | Gibbs | 1904 | $H_2siF_6$ and $H_2SO_4$ | $K_2SO_4$. |
| I | Blackmore | 1904 | $CO_2$ 500 pounds pressure repeating | $K_2CO_3$. |
| II | Piva | 1905 | (Leucite) K.O.H, NaOH, steam 25 atmospheres | K silicate. K aluminate |
| IV | Coe. Romana Solfati | 1905 | (Lucite) alkali, carbon, Ca.O red heat... heat | $K_2CO_3$. $K_2SO_4$. |
| III | Swayze | 1905 | Gypsum and carbon, fuse, volatilize | $K_2SO_4$. |
| VI | Wadman | 1907 | Lepidolite, $K_2SO_4$ $H_2SO_4$ | $K_2SO_4$. |
| II | Cushman | 1907 | Water and HFl electrolysis | K.O.H. |
| II | Swayze | 1907 | Heat alone, then KOH solution | K silicate. |
| V | McKee | 1907 | "Containing mica" with CaO, NaCl, and C. | K aluminate KCl. |
| II | Gibbs | 1909 | $Ca(OH)_2$, steam 150 pounds | K.O.H. |
| III | Spencer and Eckel | 1909 | Green sand cement, mix, volatilize | K salts. |
| I | Coates | 1910 | Bacterial action | |
| I | Carpenter | 1910 | Intense heat, sudden cooling down | |
| V | Cushman | 1911 | CaO, $CaCl_2$, etc., clumps, red heat | KCl. |
| VI | Thompson | 1911 | $NaHSO_4$, NaCl, bright red | $K_2SO_4$. |
| VI | Hart | 1911 | Ba compound as $BaSO_4$ and C, fuse, $H_2SO_4$ | Alum. |
| III | Eckel | 1911 | Cement mix but not over 900° C. with green sand volatilize. | $K_2O$. $K_2SO_4$. |
| III | Eckel | 1911 | Green sand, $CaCO_3$ and C. melt iron volatilize. | $K_2SO_4$. |

nomically. A considerable portion of the potash does not settle in the dust chamber, and if water sprays are used for washing the gases the potash solutions are very dilute and the cost of evaporation becomes prohibitive. Furthermore, water sprays are found to interfere with the draft regulation, even when the use of fans is resorted to. The maintenance of artificial draft is an expensive and difficult matter, and is very likely to infere with the proper control of the furnace temperatures. For work on the large scale of mill operation, a continuous process must be used, avoiding fusion and with the regulation of temperature to the exact point at which appreciable quantities of potash do not volatilize. The fluxes and reacting substances must be cheap, available in large quantity, and the yields of water-soluble potash salts must be high. The process which has seemed to us to give the most promise of successful adaptation to commercial ends is that of Cushman (U.S. patent 987,436), coupled with the method of preparation of the materials before furnacing, proposed and developed by Coggeshall (U.S. patent 987,554).

This process has recently been given extensive trials on a large scale and interesting results have been obtained. The process consists essentially in powdering 100 parts of potash feldspar rock, together with about 20 parts of lime and with or without 10 to 20 parts of rock salt. This powdered mixture is fed to the top of a moving drum about three feet in diameter, in a layer about half an inch deep. As soon as the layer is formed a strong solution of calcium chloride is applied from a series of small tubes. The $CaCl_2$ at once unites with the lime, forming a so-called oxychloride cement, and a large portion of the mixed powder is thereby at once formed into "clumps" or aggregates lying in a bed of surplus powder. As the drum revolves the bed is removed by a scraper to a belt which delivers the mixture to a screen which separates the clumps from the residual powder. The powder is returned by a screw conveyor and elevator to the hopper above the drum again. The clumps are about the size of peas and pass from the screen directly to a rotary kiln similar to those used in burning Portland cement. The kiln is heated by a blast of air and powdered coal in the usual manner.

The clumps pass regularly down through the increasingly heated portions of the rotating kiln and roll out at the end, practically without alteration in size and shape.

A large percentage of the total potash present in the feldspar is converted into potassium chloride during the heat treatment, and very little is volatilized. The dry clumps are of a pale-yellow color outside, due to the iron in the ash of the bituminous coal used, but they are snow-white inside. The clumps are finally ground, producing a pale-yellow material containing as much water-soluble $K_2O$ as hardwood ashes, although the potash is in the form of chloride and the product also contains considerable free lime. Up to the present time no attempt has been made on a large scale to leach out the soluble potash. The ground material is being given field tests as a straight potash fertilizer containing lime.

### A Resume of the Large Scale Experiments.

Potash feldspars were obtained from five different localities. Eleven carloads were used in the trials, amounting to a total of 385 tons. Each carload was ground and analyzed separately. The lowest in potash ran 6 per cent. $K_2O$ and 3 per cent. $Na_2O$, the highest 11.3 per cent. $K_2O$ and 3.1 per cent. $Na_2O$; the bulk of the spar 10 per cent. potash and 2 per cent. soda, and the results given in this paper were obtained on the 10 per cent. spar.

The lime was a high calcium quick-lime, running about 90 per cent. CaO and 5.6 per cent. MgO.

The salt was rock salt from New York State and ran about 98 per cent. NaCl.

The calcium chloride was obtained from the Solvay Process Company. It was in the solid form and contained about 75 per cent. $CaCl_2$ and 25 per cent. water.

All of the above materials are available in very large quantities and at low cost. The calcium chloride is a by-product in the form of a moderately strong solution, and but a small proportion is concentrated at the present time, as the chief use is for refrigeration purposes. Vast quantities are now run to waste. The solid form was used in these trials merely for convenience.

Many heats were made with mixtures of varying proportions, but the two mixtures used in the work here described were:

| | | | |
|---|---|---|---|
| Feldspar ......... | 100 | Feldspar ......... | 100 |
| Lime ............. | 20 | Lime ............. | 20 |
| Salt .............. | 10 | Salt .............. | 20 |

The feldspar, lime, and salt were separately crushed in gyratory crushers and rolls, and dried in a rotary drier. In continuous work the proper mixture would be made at this point by continuous weighing machines, but as a number of different mixtures were to be tried, each of the three raw materials was ground separately in Huntington mills and put into the bins. This preliminary grinding of the feldspar and salt was to about 65 per cent. through a 100-mesh sieve, of the lime about 83 per cent. through the 100-mesh. The weight per cubic foot of each powder of the above fineness was then ascertained, and measuring boxes were built so that the materials could be separately measured out and run together into a large mixing machine. Almost a ton was thus mixed each time. The mixture was then conveyed to a tube-mill and further ground to a fineness of from 97 per cent. to 99.5 per cent. through a 100-mesh sieve, and then conveyed to the bin over the clumper and kiln.

The calcium chloride masses were broken up and thrown on a perforated grid in a large tank holding about 48 tons. Water was run in and the chloride dissolved most readily. The solution was run out when about 42 deg. Beaume into two large sump tanks, and brought to a constant strength of about 42 per cent. $CaCl_2$. This was then pumped up to an elevated tank and piped from there through a constant-level tank to the dropper tubes of the clumper placed in a row above the drum. This drum is 15.5 feet long and 3 feet in diameter, and is horizontal. There are 15 valved pipes, each one feeding an adjustable pipe holding 38 short dropping tubes of brass 1/16-inch internal diameter and set 5/16-inch apart.

The finely-ground, mixed powder is taken from the bin by a chute, elevator, and screw conveyor and distributed in a long hopper trough over the drum. It is taken from the trough by a roll device and spread evenly on the moving drum at its topmost point. The drum has a surface velocity of about 1.6 inches per second, the layer of powder advancing at this rate.

It was found that by dropping the liquid very rapidly upon the powder the clumps could be made rapidly enough to give a full fed to the short rotary kiln when only one-third of the trough and droppers and drum is used. A clumper drum 5 feet long produces every hour almost two tons of fresh clumps and considerably over a ton and a half of burned product with the kiln used in these trials. The excess of powder passes through a screen and goes to the same elevator which lifts the original material from the bin. The amount of actual $CaCl_2$ in the fresh lime is regulated to about 20 parts to each 100 parts of feldspar in the mixture. The clumps leave the screen in rounded form and flow directly into the kiln.

The reason for the above procedure will now be explained. In the first place, calcium chloride reacts very efficiently under these conditions with the feldspar by replacing the potassium with calcium, thus forming calcium silicate and potassium chloride. Anhydrous calcium chloride is expensive to produce, and it is impracticable to grind it into a mixture on a large scale on account of the rapid absorption of moisture. Even if such a dry mixture could easily be made, its use would present certain disadvantages

When a reaction between an ore and solid fluxes is produced by heating up to the fusing temperature, the reaction takes place on the surface of the particles alone and only at the points where the ore is in actual contact with the flux particles. Finer grinding will produce a larger surface area and thus a greater number of actual contact points, leading to a larger yield. There is, however, a degree of fineness beyond which it is not wise to go on account of the cost of extremely fine grinding.

Another factor in the problem is brought out by the following experiments. A batch of ore and the theoretical amount of solid flux were ground together to just pass a 50-mesh sieve. This powder, when subjected to a certain heat treatment, gave a reaction yield of about 35 per cent. of the theoretical. The mixture was then ground to just pass a 100-mesh sieve and given the same heat treatment. A reaction yield was obtained of about 65 per cent. of the theoretical. The mixture was then ground to pass a 200-mesh sieve and again reheated as before. A smaller yield was obtained than when the material just passed the 100-mesh, although the particles were undoubtedly only half the average diameter with about four times the surface area and should, therefore, have had far more points of contact. Upon weighing equal volumes of the 50-mesh, 100-mesh, and 200-mesh powders, it was found that the latter contained far less material, and it became apparent that the 200-mesh powder consisted for over 54 per cent. of its volume simply of voids. Such finely-ground powders are well known to "surge"—that is, to show the tendency to flow like water through orifices in a manner resembling fountains. Material ground as fine as this is the cause of much trouble at spout slides and conveyors. Each particle of a material of this extreme fineness is undoubtedly surrounded by a film of air, the actual contact with the surface is lessened and friction almost eliminated. When allowed to flow into a bin, such a powder assumes an almost horizontal surface; there is practically no angle of repose. Unquestionably the lessened contact caused the low yields in the finely-ground mixtures. Some of the finer material was briquetted and the subsequent heat yield about 85 per cent. of the theoretical. Briquetting is, however, expensive and usually necessitates the addition of a binding agent foreign to the reaction.

As a result of these investigations, the method was developed for aggregating fine powders by dropping a suitable liquid upon an excess of the powder in such a way as to cause a temporary bond to form, thus practically eliminating the air films or voids around the individual particles and permitting actual surface contact. Under these conditions, with the same ore and flux used in the experiments described above, the same heat treatment yielded within 3 per cent. of the theoretical quantity present. This method of aggregating finely-powdered materials previous to furnacing has already been used in several different ways. For example, in an ore mixture in which the fluxing material is an alkaline carbonate, such as sodium or potassium, which forms crystalline salts containing water of crystallization, if the carbonate is used in the partially anhydrous condition and ground with the ore water alone dropped upon the mix in the manner described formed at once a crystalline carbonate which binds the particles of ore and flux into separate clumps, which are hard enough to withstand screening, while the air films are practically eliminated. Using such a mixture and process as this, a practically theoretical yield was obtained, although the flux was used only in the exact molecular proportion called for by the reaction.

By this clumping process a very intimate contact of reaction of surfaces is readily obtained at a low cost. The quantity of flux necessary to complete the reaction is greatly reduced, the duration and temperature of the heat treatment is lessened, and, working with rotary kilns, dusting and stack losses are almost entirely eliminated. The clumps are beautifully adapted to the feed mechanism of rotary kilns, as they flow easily, do not dust, and take the heat more evenly than fine powders. Now that the temperature conditions in rotary kilns can be accurately controlled, it would seem that many chemical and metallurgical reactions which are now performed by intermittent processes and with low yields could be much more economically carried out in continuous rotary kilns, taking advantage of this new method of forming aggregates previous to furnacing.

In the application of this method to the treatment of feldspathic rock, advantage was taken of the fact that a solution of calcium chloride acts upon dehydrated lime to form the oxychloride, which is a strong cementing compound. It was found that the formation of calcium oxychloride gave a sufficiently strong bond to enable the aggregates to withstand the operation of screening and the burden in the kiln.

The theoretical quantity of calium chloride flux required depends upon the total quantity of $K_2O$ and $Na_2O$ present in the mix, as it is evident that the soda must also be liberated in proportion to its content. The feldspar ore used ran 10 per cent. $K_2O$ and 2 per cent. $Na_2O$, which required theoretically 15.5 parts of calcic chloride.* In all our trials some slight excess of calcium chloride has been used. The strength of the solution and the method of treatment have been such that about 20 parts of actual calcium chloride are present in the fresh clumps to every 100 parts of feldspar. The 20 parts of lime used are for the purpose of forming the aggregates, and this lime remains practically unchanged in the finished product. The presence of lime in a potash fertilizer will be found advantageous to most soils, and it is generally admited that lime increases the manurial value of a fertilizer. If the object was to leach out the soluble potash salts from the product, a much smaller amount of lime could be used without interfering with the formation of hard clumps. The salt is added because it has been found to aid the heat reaction, probably mechanically, as will be explained later on. The fresh clumps contain from 16 to 20 per cent. of moisture, which is, of course, evaporated in the upper part of the kiln.

The rotary kiln used in these trials was one of the old bottle shape cement kilns with a total length of slightly over fifty-five feet, the upper twenty feet having a diameter of 4 feet clear inside the firebrick lining, the lower portion widening out to nearly 6 feet inside diameter. The pitch was ⅞-inch per foot, and the most suitable speed was found to be one revolution in about 2½ minutes.

The conditions of the heat treatment are very important. The kiln used was too short to yield the best results, and after the preliminary experiments changes were made which caused the material to take about $1\frac{1}{2}$ hours to pass through the length of the kiln. The temperature of the gases issuing from the upper end of the kiln were read continually with a thermo-couple pyrometer fitted with a 15-foot fire end, and temperatures were also taken from time to time at the firing platform. A furnace wall temperature of about 1370 deg. C. is required for efficient burning of powdered bituminous coal. This is, however, much too high a temperature for potash work in a rotary kiln. This difficulty called for careful experimental investigations and adjustments of the heat treatment before the proper yields could be obtained. If a longer kiln had been available, there is every reason to believe that a more efficient use of the heat could have been obtained. The coal used was a fairly high volatile bituminous coal. It was ground to about 94 per cent. through a 100-mesh sieve and blown into the furnace under an air pressure of about ten pounds per square inch.

During the progress of the clumps down the kiln the following reactions probably take place: At the entrance to the kiln the water begins to evaporate. As the hotter zone is approached, the temperature rises high enough to melt calcium chloride and salt. Whether the calcium chloride is free to melt is not known to us, as the exact composition of the oxychloride compound formed has not yet been determined. The results of our work seem to prove that the reacting chlorine is more readily evolved from the oxychloride compound than it is from calcium chloride alone. The melting of the salt, however, continues the bond of the reacting particles, causing them to thoroughly "wet" each other, and from this point on the attack on the silicate proceeds rapidly. During the heating usually from 1 to 2 per cent. of $Na_2O$ is volatilized.

When operating with no salt present, the yield of soluble potassium chloride was 47.5 per cent. of that originally present in the feldspar. On adding to the mixture 10 parts of salt to each 100 of spar, a test heat yielded 64 per cent., but of this 9 per cent. was lost by volatilization, giving a yield of 55 per cent. net in the final product. On adding 20 parts of salt to the mixture the yield grows to 69.2 per cent. with no volatilization and to 75 per cent. under heat conditions which caused a volatilization of 7 per cent., leaving a net yield of 68 per cent. of that originally present. In the case of clumps made from a mixture of 100 parts of feldspar containing 10 per cent. $K_2O$ and 2 per cent. $Na_2O$, 20 parts of lime, 20 parts of salt, and 20 parts of calcium chloride, the theoretical composition if no volatilization loss takes place is shown compared with the actual results obtained in the following table:

| | Theory. | Analysis. | |
|---|---|---|---|
| Total $K_2O$ | 6.25% | 5.8% | |
| Water-soluble $K_2O$ | ...... | 4.2% | Equals 6.65% KCl. |
| Loss of $K_2O$ | ...... | .5% | As KCl already formed. |
| Total $Na_2O$ | 7.62% | 7.1% | 52% made into NaCl. |
| Water-soluble $Na_2O$ | 6.37% | 5.1% | Showing 1.79% vaporized as NaCl or 26% of that present. |

This particular product contained 11.2 per cent. of free lime, and total lime by analysis 15.5 per cent. There was also in this sample about 5 per cent. of free unchanged calcic chloride. The amount of calcic chloride in the various runs made up to the present time has been reduced gradually to about 1 per cent., and it is felt that in the future better conditions of heat treatment will make complete use of the calcic chloride and at the same time raise the yields of soluble potash. In later runs, in which only 10 parts of salt were present in the mix, the theoretical and actual analysis of the product was as follows:

| | Theory. | Analysis. | |
|---|---|---|---|
| Total $K_2O$ | 6.66% | 5.62% | |
| Water-soluble $K_2O$ | ...... | 4.5 % | Equals 7.12% KCl. |
| Vaporization loss of soluble $K_2O$ | ...... | 1.04% | As KCl already formed. |
| $K_2O$ insoluble in water | ...... | 1.12% | |
| Total $Na_2O$ | 4.15% | | |
| Water-soluble $Na_2O$ | ...... | 3.7 % | Showing 0.45% vaporized as NaCl or 11% of that present. |

This product contained 12.25 per cent. of free lime, the total potash rendered soluble was 5.45 per cent. of the product or 83.2 per cent. of the total quantity present, but as 15.6 per cent. had been volatilized the net yield in the product amounted to 57.6 per cent.

The material which was later made continuously according to the process described above carries 4.5 per cent. of water-soluble $K_2O$ in the form of 7.12 per cent. potassium chloride, and in addition to this material carries only 1.12 per cent. $K_2O$ insoluble in water. It is well known that a 2 per cent. citric acid solution will extract, when used according to the Wagner method, somewhat more $K_2O$ than can be made directly water-soluble. This fact is of considerable interest when the product is to be used directly as a potash fertilizer.

## Conclusion.

It is believed that under better conditions of heat treatment which can be obtained with longer kilns and with a somewhat different arrangement of the combustion chamber, slightly better yields than those reported can be obtained. It should be remembered that the kiln used in these experimental trials was originally designed for burning cement, but this type of kiln has long been superseded by improved forms. In order to get the proper heat treatment in the middle of the kiln to complete the reaction, it was necessary to have the upper part too hot. This condition will not maintain in a properly-designed kiln. It is also believed that the use of oil as fuel would have allowed an easier regulation of the heat treatment, but the trials so far undertaken have been made conditions which were found available at the time.

The subject of the costs of this process and of the product cannot be gone into in detail at this time, but a few general statements may be made. The production of water-soluble potash in feldspathic work is essentially a low-grade proposition, and the commercial success of such a process depends upon the low cost of the various operations. The manufacture of a straight potash fertilizer containing as valuable ingredients only potash and lime must be carried out on a very large scale and by the most modern methods of continuous operation. With regard to the clumping process, the trials have shown that this operation can be practically carried out as a continuous process and at an exceedingly low charge per ton of product.

The process may be directly compared with that of the manufacture of Portland cement. It is little easier to grind feldspar and lime than the shales and limestones used in cement manufacture. Drying will cost no more. Chemical control of the raw mixes will not be more expensive, and perhaps much less. Clumping, as has been shown, adds a very small charge to the expense of treatment. The cost of furnacing the feldspar mix will be less than similar charges in the cement industry, as the temperatures required are much lower and less coal is consumed. The product from the potash kiln is comparatively soft and pulverizes easily in hammer mills, while the charges on the cement industry for grinding clinker are an important item. Again, the softer potash product merely requires to be ground fine enough for use as a fertilizer, whereas cement clinker must be ground very fine and costs rise rapidly with increasing fineness. Repair bills in the case of feldspar treatment should be much smaller than in cement manufacture. The charge for raw materials is somewhat larger than in the case of cement, but this is more than met by the smaller costs of operation.

The potash fertilizer as now produced should be the equal in fertilizing value of the ordinary grades of hardwood ashes. The product carries practically the same content of water-soluble potash and somewhat more lime than wood ashes. There is every reason to believe that if the process becomes an industry the yields of water-soluble potash can be considerably improved. The material yielded is not a fused product; it is friable as an ash and it has the physical texture to make it a valuable aid to soil structure. The success of the product must, of course, depend upon the results obtained under test conditions in its experimental use as a fertilizer. If results are obtained which are as good as, or better than, those which usually attend the proper use of high-grade wood ashes, it is believed that there should be no reason why this product cannot be successfully produced and introduced, especially in those parts of the country where potash feldspars, fuel, and shipping facilities are available.

### Summary.

In this paper a summary is given of the various processes which have been proposed for making the potash in the natural silicates available as a fertilizer.

Experimental trials of a new rotary kiln process for treating feldspar are described, which depends upon a previous treatment before furnacing, consisting of a method of aggregating or clumping the mix so that chemical contact of the reacting substances is brought about during the subsequent processing. The qualitative and quantitative results obtained on a number of experimental trials on a mill scale of operation are presented and discussed. It is shown that it is possible to economically manufacture a potash fertilizer containing free lime from feldspar, and for a sufficiently low cost to make an industry based upon the method worthy of consideration.

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# MINING PROSPECTS.

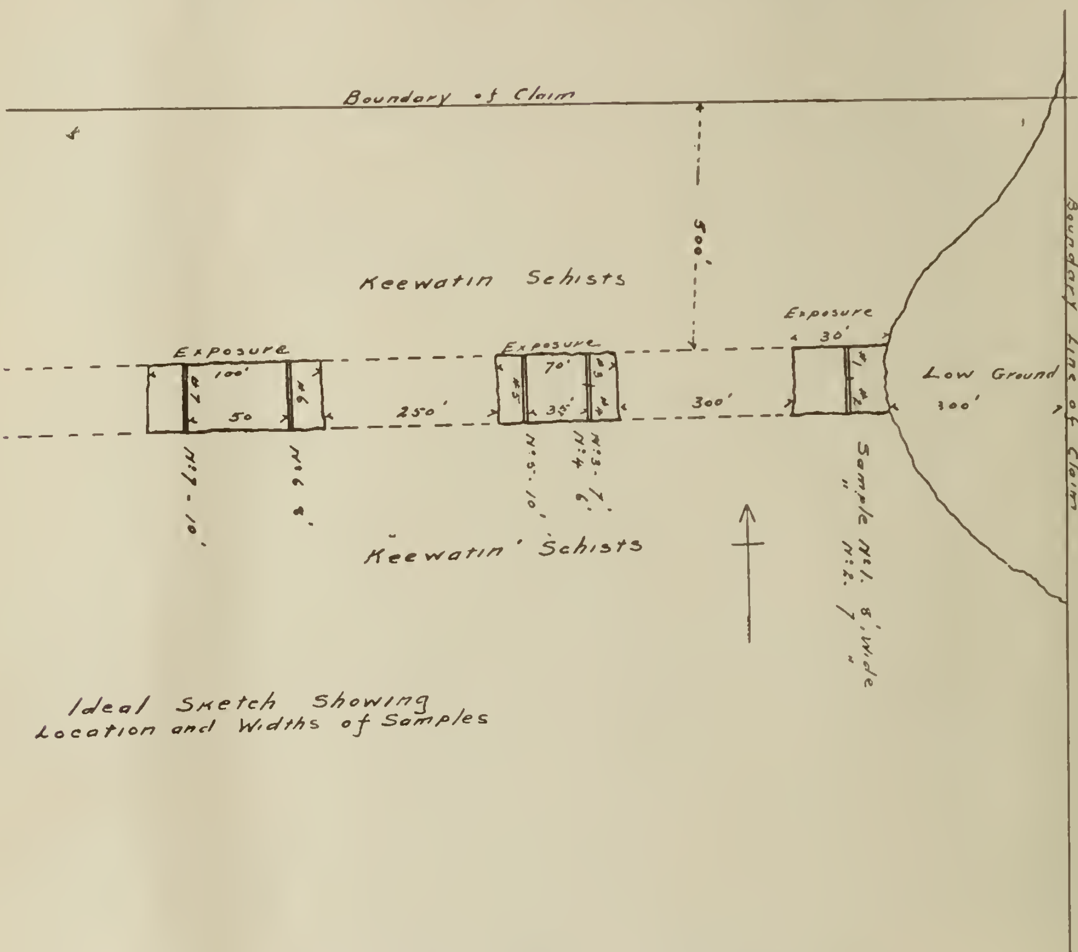
(Written for the Canadian Mining Journal by an Examining Engineer)

The examination of a prospect is one of the most difficult things that the average engineer has to undertake, as in many cases it calls for more qualifications than the examination of a developed or partially developed mine. The information available is usually so meagre that it is often extremely difficult to decide whether or not a property warrants the expenditure of money. In submitting a prospect for consideration it is, therefore, essential that the owner of the property gives as much information as possible. All engineers, and particularly those associated with development or exploration companies, have many prospects presented to them, and, in the majority of instances, they are not given any consideration on account of insufficient detail. Examinations of prospects are usually attended by considerable discomfort and expense and engineers are loth to undertake them without something definite to go on. In many cases, promising prospects are allowed to lie undeveloped because the owner has not taken sufficient trouble to present his property in proper form.

The usual method of procedure is to send a few selected specimens, accompanied by a glowing description of mineral wealth which only needs development to bring in immense fortune to the person lucky enough to acquire the property. Incidentally the owner usually asks an extremely high price and a substantial payment down. Selected specimens, are, however, of little value to the engineer and have a tendency to mislead him instead of giving valuable information. The writer recalls one instance in particular where the owners brought in some rich specimens of free gold, claiming that the vein averaged six feet in width, that it could be traced for a long distance, and that the lowest assay ever obtained was $6.00. The examination necessitated a two days' trip into the bush under most disagreeable conditions, and when the property was finally reached, it was found that the vein would not average more than fifteen inches in width and that the specimens brought to the office accounted for practically all the free gold there was. Outside of this single showing of gold, the highest assay from sections across every part of the vein was 80 cents.

In order to properly present his property, the owner should send as complete a description as possible. The accessibility of the property, together with the general geological features should be stated, and particular pains should be taken to give clearly, the character and average width of the vein, the distance over which it can be traced, the number of exposures, and how far these have been stripped and how far apart. Samples from the various outcrops should also be sent. These samples can very easily be cut with a small prospector's pick and a moil and should weigh approximately two or three pounds per lineal foot of trench. The width of the samples should be carefully measured and each sample should be put in a separate sack with a separate number and sent to the engineer, accompanied by a sketch, no matter how rough, showing the location and width of each sample, and the distance apart of the different sections. Where a vein is much over ten feet wide, it is usually advisable to split the samples, taking not more than ten feet for each. In this way, the location of a possible pay streak can be determined, and it might show a profitable section of ore, which, over a greater width, would be unprofitable.

The work outlined above can be done by any man having a very slight knowledge of mining, and while, of course, an engineer would not purchase a claim on these results, it would enable him to obtain a fairly comprehensive idea of the width and assay value of the ore and would certainly entitle the seller to much more consideration than he would otherwise be likely to obtain.




Ideal Sketch Showing Location and Widths of Samples

# TECHNICAL LITERATURE.

**The Relation of the Horse-Power to the Kilowatt.**—Prior to 1911, no precise definition of the horse power that was generally accepted and authorative, was current; and different equivalents of this unit in watts, are found in text books. The most frequently used equivalent in watts, both in the United States and in England, has been the round number 746 watts. The United States Bureau of Standards has issued a circular in which it is pointed out that it is obviously desirable that a unit of power should not vary from place to place, and the horse power thus defined as a fixed number of watts does indeed represent the same rate of work at all places. Inasmuch as the "pound" weight, as a unit of force, varies in value as g the acceleration of gravity varies, the number with the latitude and altitude. It is equal to 550-foot pounds per second at 50 degrees latitude and sea-level, approximately the location of London, where the original experiments were made by James Watt to determine the magnitude of the horse power. The "continental horse power," which is used on the continent of Europe differs from the English and American horse power by more than 1 per cent., its usual equivalent in watts being 736. These values, 746 and 736 watts, were adopted as early as 1873 by a committee of the British Association for the Advancement of Science. The value, 0.746 kilowatt will be used in future publications of the Bureau of Standards as the exact equivalent of the English and American horse power. Both the Bureau and the Standards Committee of the American Institute of Electrical Engineers recommend the kilowatt for use generally instead of the horse power as the unit of power.

**Dredging in the Yukon.**—Dr. H. M. Payne describes, in the Engineering and Mining Journal of December 14th, the present method of dredging on Bonanza creek, the results of which, we understand, have during the past season, proved very gratifying. Here, whenever practicable, the dredging of the creek bottom precedes the hydraulicing in order to avoid handling the hydraulic tailings through the dredge, although in some instances it has been found profitable to wash these tailings again through the dredges. The gold-bearing gravel and overlying muck being frozen, it is first thawed by driving steam points down to bedrock. The points are spaced at intervals of from 8 to 10 feet, and driven from 5 to 30 feet down, depending on the depth of the frozen overburden. Steam is generated by portable boilers and transmitted through a main 3-in. pipe to 2-in. headers and 1½-in. goosenecks, with which the points are connected by rubber hose. These points are in varying lengths, like drill sets, and are advanced as thawing takes place by men standing on step ladders and wielding sledge hamers. It is aimed to thaw several weeks' in advance of the dredges in order that the ground may "sweat," and thus thoroughly disintegrate the frozen mass, the black muck on the surface acting as an insulator and retaining the heat introduced through the points. The dredges are of the regular type, with buckets averaging 7 cubit feet capacity, and a chain speed of 18 buckets per minute, giving a theoretical capacity of 6,720 cubic yards per 24 hours.

**Asbestos in West Australia.**—The Geological Survey of West Australia has issued recently a report by Mr. Torrington Blatchford on the asbestos deposits at Soanesville, in the Pilbarra goldfield. The rocks here are serpentine, which has been intruded by dolerite dykes. Asbestos has been found in several places within the area, but only two exposures have been prospected to any extent. Locally, these deposits are known as the "A" and "B" lodies. In the "A" deposit the fibre is short, and fit only for mill treatment. On the "B" lode, which has been developed to a depth of 149 feet, some very fine asbestos has been exposed, the fibre being in places several inches in length and of exceptional quality, but apparently the deposit is very narrow. The author thus concludes his report: "Up to the present the boundaries of the serpentine rock are hidden by the Nullagine series of altered sediments. This is unfortunate, as there should be more possibility of finding large formations of asbestos near the boundaries of the serpentine than anywhere else. . . . The total cost of producing the marketable product at Pilbarra aud pntting it on a local or foreign market, including labour of mining, cobbing and bagging, transport, etc., would probably not exceed £20 per ton. There is, therefore, a good margin of profit in working good crude fibre. In estimating the value of milling fibre, the difficulties are many. If the average price of all grades of mill fibre be taken, the Canadian price is £6 per ton. Taking the asbestos veins as they stand exposed in the workings, and after making due allowance for high mining costs under existing conditions, it would cost at least 20s. per ton to mine and mill the asbestos rock on the spot. If the percentage of recoverable fibre and milling rock be twenty, this would mean a cost of £5 to produce one ton o fmill fibre, exclusive of cartage, freight, realization charges, etc." The shipments of asbestos so far made represent 40 tons, valued at $1,600, sold in 1908, and 283 tons, valued at £154 sold in 1909.

**The Care of Wire Rope.**—A writer in the Engineering and Mining World remarks that the life of a rope is materially reduced if made to work round small drums and pulleys. When considering the size of pulleys for underground haulage, convenience of handling is the important factor, and, therefore, the ratio usually observed between the size of a winding rope and its pulleys is much reduced. For underground haulage a satisfactory workable minimum diameter for a sheave or pulley is 60 times the diameter of the rope. Thus a three-quarter inch rope would require a pulley 3 feet 9 inches in diameter. If the pulley is larger the rope is so much the better for it, but if made smaller it is done at the risk of injuring the rope, unless it be of special construction. A high speed of rope means a considerable amount of wear, and it is better to increase the load than the speed. Jerking is ruinous to ropes, and a careless engineman may easily, by picking up his load rashly, snap even a new rope. Ropes before use should be stored in a dry place, upon timbers; and if left a long time, oiled over occasionally. Where they are not galvanized ample protection should be afforded by a suitable oil, free from any ingredient that might set up corrosion. Hoisting ropes are usually well served in this respect, while haulage ropes are just as much neglected. The following test shows the importance of greasing ropes: Two lengths of rope, same size, same make, one oiled the other unoiled. The latter made 16,000 bends, and the former 38,700 bends over the same pulley before breaking. Again, similar pieces were tested over a 24-inch pulley. The unoiled stood 74,000 bends and the oiled 386,000 bends before breaking.

**The Dry Cleaning of Coal.**—The Mining and Scientific Press comments recently on a process for the dry cleaning of coal in use in Franklin county, Irrinois. The coal is first carefully sized on a series of gyratory screens, and then by a spiral separator which makes three products: coal, bone coal, and slate. The spiral separator consists of a centre column, with a series of spinal bands, down which the coal and slate slide. The coal maintains a fixed path as long as the friction of the coal on the chute and the centrifugal force balance. As the velocity increases, to where it overcomes the friction, the coal moves over the outer edge of the spiral plate and is carried off through a hopper. The slate, with a higher co-efficient of friction, follows the regular path down the spiral and at the bottom goes into the refuse pocket. The bone coal takes a path between the two and slides to the outer edge of the spiral, but does not follow the coal over the edge. It is delivered at the bottom through a special gate, and may then be conveyed to the boiler house.

**Electrolytic Extraction of Copper.**—The United States Consul at Christiania reports that for several months past a company at Aamdal, Norway, has been extracting copper successfully from the crude ore by means of an electrolytic process invented by Victor Hybinete, a Norwegian engineer. The treatment, which is done at the mine, thereby effecting considerable economies in shipping costs, consists in leaching the crushed ore with a solution of sulphuric acid which dissolves out the copper; a strong current of electricity is then passed through this solution and the pure copper is precipitated. Experiments on copper pyrites, elsewhere in Norway, have proved equally successful.

**A New Nickel Extraction Process.**—The Engineering and Mining Journal describes a new process for which a patent has been granted to Horace L. Wells, of New Haven, Conn., for the extraction of nickel from nickel-copper matte by means of hydrochloric acid. The matte is pulverized to 60-mesh, or finer, and treated with 18 to 25 per cent. hydrochloric acid at a temperature between 110 and 212 F. The first solution is then decanted or filtered off, and the residue is again treated with further amounts of acid. This is done because one treatment will not extract all the nickel, no matter how long continued or how strong the acid. The acid used in the second treatment is not exhausted and is available for use as the first leach in treating a succeeding batch of nickel matte. The matte is agitated during this treatment. The solution of nickel chloride thus obtained is treated for nickel or for nickel salt, as provided for in the various other patents of T. C. King and H. L. Wells.

**The Study of Earthquakes in Germany.**—The Colliery Guardian calls attention to a recent description of the appliances used in the magnetic observatory and earthquake station connected with the Bergewerkschaft at Bochum. The object of the station is to observe and to record the phenomena of natural and "artificial" earthquakes and to study them in their bearing upon mining. The Bergewerkschaftkasse, it may be mentioned, is a common fund to which all the mine proprietors of the district have to contribute. Prof. Heise is the director of the schools. The equipment consists of three astatic Wiechert pendulums, two suspended so as to record the horizontal components, and one for registering the vertical component. There are also two portable horizontal pendulums, each for two components, of the Rebeur type, for recording gradual changes and inclinations and depressions caused by excavations in mines. The third set of instruments comprises two highly sensitive portable seismometers for photographic records, the one a horizontal pendulum of the Weichert-Mintrop type, the other a universal pendulum of Dr. Mintrop. The records are produced in kinematograph fashion. With these instruments the movements of the ground are being observed continuously at Bochum.

# METHODS OF PROSPECTING AND DEVELOPING DEPOSITS IN MICHIGAN.

By R. E. Hore.

The method of prospecting in the copper country is now in almost all cases diamond drilling and trenching. The outcrops have long since been carefully looked over, but there still remains to be prospected a very extensive area, which is covered with glacial debris. The most notable new discoveries during the past few years have been made by drilling in such covered areas.

Exploration is also carried on underground at several mines. It is usual near an important lode to find parallel lodes which are not regular enough to be worked alone, but which carry at intervals copper in quantities sufficient to pay for extraction. In some mines prospecting for such deposits is carried on by systematic drilling into the foot or hanging from the workings on the main lode. In others, cross-cuts are driven at less frequent intervals for the same purpose. In mines where a filling system is used, the rock cuts into hanging and foot are run far enough to explore other lodes.

In putting down the first drill hole in an exploratory campaign in drift covered areas it is the usual practice to set the drill at an angle normal to the dip as determined on neighbouring properties. If the hole proves to be approximately normal to the bedding, other holes are bored at such distances that each will give a slight overlap over the section obtained in the next one. Many of the holes are drilled 1,000 feet to 2,000 feet. Where there is little known concerning the stratigraphy, the most satisfactory results are often obtained by vertical holes.

The cores drawn are closely examined for copper; and also for the purpose of correlating the various strata cut. Commonly all the core is kept regularly arranged in boxes. At intervals in the core-box a mark is made to indicate the depth from which the core was taken. After examination the cores are usually stored and kept for future reference.

**Development.**—When a lode has been located, development is usually begun by sinking an inclined shaft in the lode or in the foot-wall. Exploration is carried on by drifts at levels about 100 feet apart. As a rule it has been found advisable in running these drifts, to follow the hanging or the foot-wall rather than to take straight courses. On the Calumet conglomerate the drifts are on the foot, but on most of the amygdaloid lodes the hanging wall is followed. This practice enables the miner to keep to a definite horizon, as the contact of the hanging wall trap with the lode is usually rather distinctly marked. Moreover, a bed that is cupriferous usually shows most regular ore shoots close to the hanging, so in keeping to the hanging the miner is, most of the time at least, following the ore. In a few mines the hanging is not very closely followed, but this is largely because in these mines the contact is not easily recognized. In another mine thousands of feet of drifts run in regular courses in the copper-bearing bed disclosed very little ore, while subsequent drifts following the hanging proved up very large deposits. The wisdom of keeping to the hanging was early recognized, and with a few exceptions the best results are still obtained in this way. There are some cases, however, in which it is perhaps just as well to follow the foot. In wide lodes there is usually much copper close to the foot, as well as close to the hanging. If then, the foot-wall is more easily identified than the hanging, as sometimes though rarely happens, it may be preferable to follow the foot. In the conglomerate mines the foot is followed because it presents a good fact to draw the cut to, rather than on account of the values there. As a rule drifts run without following closely the foot or hanging, soon get away from the ore, and are of comparatively little use in estimating the value of the deposit. There are, however, a few cases where the broken nature of the ground makes it practically impossible to follow foot or hanging closely, and then courses are run along the strike of the bed.

When it is desired to explore at depth the underlay of a lode productive on adjoining property, vertical shafts, are sunk and at various levels cross-cuts run into the lode, which is then developed in the usual way. At some mines similar "deep' ore is reached by starting the shaft down at an angle of about 80 degrees and curving at depth into the dip of the lode.

There are in Houghton county three vertical shafts that are very nearly one mile in depth, and several shafts on the slope of the lodes that are down over one mile on the incline. The deepest vertical shaft is 5,308.5 feet and the longest inclined shaft is 7,995 feet measured on the dip.

The ore cannot be satisfactorily sampled in the mine. After considerable ground is blocked out it is tested by a mill run extending over a few months. The usual practice is to rent a stamp at one of the mills and test the ore thoroughly before erecting a new stamp mill.

**Methods of Mining.**

As all the deposits being worked are in the form of inclined beds there is a marked uniformity in the way in which the lodes have been opened up. The method of mining the ore, however, is by no means the same for all the mines. The method adopted depends chiefly on the geological conditions, especially on the dip and thickness of the deposit and firmness of the lode and wall rocks. As a rule the copper deposits are in unusually uniform and firm rock that is easily supported. There are, however, some mines in which the lode or hanging wall is full of seams and joints, and the necessity of providing support has then then made it advisable to use a different method of mining. The greatest similarity in methods is found in mines working the same lode.

There are also, however, notable differences in method which do not result from the geological conditions, and which may be seen on the same lode and often in the same mine. Very often stoping has been started near the shafts and advanced toward the boundary, while in other cases stoping has been begun at the boundary and advanced to the shaft pillar. The latter makes less support necessary, thus making it possible to allow the ground to cave soon after a stope is cleaned out, and at the same time renders protection for levels necessary only under the one stope being worked.

In some mines drifts are run of ordinary size 7 feet by 7 feet, while in others the opening is carried forward as a drift stope, by cutting the full width of the lode and taking a few cuts off the back. The drift stope method gives a better opportunity to follow sinuosities of a lode closely, thus making possible a more definite estimate of its contents; but unless the lode is very uniform in grade there is likely to be broken rock that might be better left standing. In long drifts the better ventilation in the large opening is a decided advantage.

In wide lodes the ores is not as a rule evenly distributed, and a considerable percentage of the lode is worthless. There is then to be decided whether it is better to break the full width of the lode and sort out the waste, or to make the selection before breaking, and as far as possible leave the poor rock standing. The mines on one lode use the former method, while on another wide lode the latter system is utilized.

Methods of handling the ore differ largely according to the nature of the deposit and also for other reasons. In some mines mechanical scrapers are used in stopes, while hand shovels are used in others under similar conditions. In one mine chutes are used to load tramcars, while in another mine where the dip of the lode is practically the same, the ore is allowed to run down to the track level and then is shoveled up into the cars. In most mines the men themselves push the tramcars, while in others rope haulage or electric locomotives are used. In most mines the ore is dumped directly from tramcar into skip, while in a few, ore pockets are used. In most of the mines ore is hoisted from every level; but in some the ore from four or five levels is run down in chutes and hoisted from one level.

The methods of mining in use will be best understood from brief descriptions of the practices in individual mines. The variations dependent on the nature of particular deposits will be brought out by taking as examples mines that are on different lodes. For the conglomerate lode we can take the workings tributary to one shaft at the Calumet and Hecla mine; for an amygdaloid 14 feet thick and with dip of 40 degrees; for a narrow amygdaloid at a steeper angle (45 degrees), the Hancock; for deeper workings on a narrow amygdaloid dip 38 degrees to 45 degrees, the Quincy; and for a wide amygdaloid of steep dip (73 degrees), the Baltic.

**The Calumet and Hecla Mining Method.**—The Calumet and Hecla conglomerate is now being mined at great depth from several shafts, one of which is vertical and the others inclined. The lode averages 15 feet in thickness, and dips usually at an angle of between 37 degrees and 38 degrees.

The incline shafts are sunk in the lode, and levels established at intervals of about 100 feet. Drifts 8 feet by 8 feet are run each way from the shafts to the boundary. A raise is put through for ventilating, and to provide a stoping face, and stoping is begun first at the boundary. A cutting out stope is run for 100 feet by cutting a slice off the back for the full width of the lode. Then heavy timbers are put in to support the hanging and protect the level. No square sets are used. Heavy timber is placed as stulls, three large sticks being placed close together and forming a so-called battery. Batteries of stulls are placed about eight feet apart, leaving a space of about five feet. In this space a chute is built at sufficient height to deliver the ore into tramcars. Above the chute the foot is covered with an iron plate 8 feet by 4 feet to enable the ore to run readily.

When stulls and chutes are in place heavy lagging is placed across the stulls, planks are placed over the timbers for the drillers, and regular stoping is commenced by breast cuts taking off 8 feet to 12 feet at a time. In each 100-foot stope two or three drills work a short distance apart. As each cut is taken off the back, additional stulls are placed in line above the others. The broken ore falls down between the rows of stulls, and with some assistance from shovellers runs down to the chute and is loaded into tramcars. As the process goes on the ore is replaced by regularly spaced rows of stulls up to within a short distance of the next level. Stoping is carried on until all the ore is broken, no pillars being left anywhere in the stope. There are no arch pillars to support the levels above. The whole section of the lode is broken and swept down between the rows of stulls into the tramcars, mechanical scrapers being used to drag the ore down.

When the stope has been cleaned out, a solid row of heavy stulls is set across the foot of the stope, a considerable portion of the timber in the stope being robbed. The stope is then allowed to cave, the car-tracks are taken up, and the thoroughly worked out part of the mine immediately abandoned. The 100-foot block next towards the shaft is then attacked in the same way, and at the same time in the next lower level, stoping is begun at the boundary. Stoping is always done at several successive levels at the same time, and in any one level stoping is always being done in a block 100 feet nearer the shaft than the work in the next lower level. At the shaft a pillar 100 feet wide is left on each side.

To work out a stope takes about eight months. Hence, stulls across the foot of the stope, while necessarily heavy, do not need to be of long-lived wood. Consequently the heavy stulls are not of very valuable wood; but of timber common in the district—hemlock, birch and maple being generally used. The hardwood is used green and does not last long after it dries. Sometimes before a stope is worked out, caving starts in the level above, and small quantities of rock fall down onto the row of stulls. No damage is done, as the timber is still strong and the amount of caving slight. In a year or two the timbers have become weak, but by this time there are no miners in the stope below. At intervals there occur caves in the hanging and ultimately the stope is filled with the broken rock.

There is no sorting of the broken ore in the mine. Sometimes blocks of poor ground are left standing; but everything broken is hoisted. The tramcars are pulled to the shaft by air-engine rope haulage, and the ore emptied directly into skips. A seven ton skip makes seven or eight trips an hour to surface from a depth of 7,000 feet. At surface a little rock is picked out, as the ore is fed to the crushers.

**The Wolverine[3] Mining Method.**—The Wolverine mine works a section of the Kearsage lode, which here dips at an angle of 40.5 degrees to 41.5 degrees and averages 14 feet in thickness. Shafts are sunk in the foot-wall and levels established at intervals of about 100 feet. Drifts are carried forward as drift stopes. The drift itself is about 6 by 7 feet and the lode is cut out for its full thickness for a distance of 19 feet from the foot rail. When the drift stope has been advanced a few hundred feet a block of ground 75 feet long is marked off, and this is stoped out by four men on contract. The whole block is drilled by only one machine. A block is stoped out in about four months. The first block being raise and stope requires several weeks longer.

Owing to the dip there is no difficulty in rigging up drills on the foot, and at the same time the inclination is sufficient to allow all but the finest ore to run down to the level. No protection at the level is necessary, and no timber is used in the stopes. Rock pillars are left along the foot of the stope and a 8-foot to 10-foot floor pillar in the back. The ore runs onto a sollar beside the track, and is shovelled up into the cars. At the Mohawk mine where similar methods are used, the dip is in places not sufficient for the ore to run, and iron chutes are used in cleaning the stopes. A large number of cars are used at each level, and the trammers leave their loaded cars at the shaft. A special crew of workmen load all the ore into the skip, working their way down from level to level, and then riding up and going over the ground again.

**Hancock Mining Method.**—At the Hancock mine is illustrated an economical method of mining a narrow lode dipping at an angle of about 45 degrees. In mining this lode use is made of a vertical shaft which is being sunk to open up the Pewabic lode at greater depth. In early workings an inclined shaft was sunk to the thirteenth level and three lodes opened up. The present method is in use below the thirteenth level on No. 3 lode.

A winze was sunk in the lode for about five hundred feet, and the lode worked from levels about 100 feet apart. At the eighteenth level connection was made with the vertical shaft by a long cross-cut. The winze was then no longer used for hoisting, but was converted into a chute, and all ore from upper levels brought down to this level.

Drifts are run 6 feet by 7 feet. A cutting out stope follows enlarging the opening to 24 feet. A row of stulls 4 feet to 6 feet apart is set above the level and lagged over with cedar poles 4 inches to 6 inches diameter. At intervals of about 25 feet a hole 2 feet by 4 feet is left in the lagging, and a high sollar built about 4 feet above the car rails. When the level is thus protected and provision made for handling the ore, stoping is commenced. In the first cut care is taken not to shoot the rock directly against the timbers. After a few feet of broken ore lies on the lagging, the remainder of the ore can be broken with wet holes. Enough ore is left in the stopes to support the miners and the rest drawn off. The ground is firm and no timber is used in the stopes. Rock pillars are left where poor rock is found, and an arch pillar, 6 to 10 feet thick, is left in the back of the stope to support the level above. The ore is drawn out of the stopes onto the sollars and there sorted and loaded into tramcars. The cars are pushed by hand to the converted winze, which is now a chute having two compartments, one for ore and one for rock. At the bottom of the chute the ore is loaded into saddle-back tramcars, each holding about three tons, and drawn by electric locomotive to the vertical shaft. Here the cars are run over bins into which their contents are emptied. From the bin the rock is let into the skip by raising a heavy gate, and dropping an iron lipped chute over the edge of the skip.

**Quincy Mining Method.[4]**—At the Quincy mine narrow amygdaloid lodes, dipping at an angle of from 54 degrees to 38 degrees, are being worked at great depth. The conditions are somewhat similar to those at the Calumet and Hecla conglomerate mine, but comparatively little timber is used. Support is chiefly by rock pillars, and by heavy stulls loaded with broken rock. Drifts, 7 by 6 feet, are run in the lode. Commonly the drifts are partly in the foot-wall. The miners driving the drift are closely followed by others cutting out the lode for a width of 18 feet from the foot-rail. Following the miners making the cutting out stope come timbermen who protect the level and make provision for drawing off the ore into tramcars. When a cutting-out stope has been timbered and the levels ready, drills are started in the stope. The several groups of men are all gradually working their way from the shaft to the boundary.

The level timbering was formerly of stulls placed about 4 feet apart and covered with cedar poles. The present method differs in the absence of lagging consequent on close spacing of the stull timbers. This gives better protection from falling rock and is said to be cheaper. The stull are logs of peeled hemlock, maple and birch, averaging 15 inches to 24 inches in diameter—some are 3 feet in diameter. These are set in a row at the foot of the stope, and are only four or five inches apart. At intervals of 15 feet a 5-foot space is left and a high sollar is built. A 2-foot hole is left so that the ore can be run out onto the sollar. In some parts of the mine the ore is run out on timbers over the level and dropped into the car.

In stoping there are numerous pillars left scattered irregularly in the stope wherever the lode is poor or where support is especially required. Many are in places where the hanging bellies down. In places stulls are set in the stope for support, either as single sticks or in batteries of three. In some stopes the workmen stand on rock-covered platforms supported by stulls and work down the stope from either side of a raise.

A common practice is to have three drills working on the face towards the boundary. Each takes off a slice by five or six breast cuts in descending order, and then goes up in the stope and works down again, taking off another similar slice.

When the stope is mined out, the row of heavy stulls at the foot is heavily loaded with rock. This "poor rock" is commonly obtained by breaking into the footwall, as it is desirable to disturb the hanging as little as possible. Rock is piled onto the stulls to a depth of 30 or 40 feet. Later, as the hanging settles down, the stulls are compressed—often splitting longitudinally, and shortening 6 or 8 inches—and then the rock filling wedged tightly into place, takes up the pressure.

The ore is drawn off onto the high sollars and loaded into tramcars. For short distances, 500 to 600 feet, the cars are pushed by men. After the distance becomes greater, electric locomotives are used to haul trains of 4 or 5 cars loaded with about 3 tons each.

The ore is not loaded from tramcars into skips, but is emptied into ore pockets near the shaft. From these pockets, some of which hold 100 skiploads, the ore is drawn off[5] at a lower level into the skip.

**The Baltic Mining Method.**—The Baltic is one of several mines on the Baltic lode, which is wide, 15 feet to 60 feet, and has an unusually steep dip—73 degrees.

Shafts are sunk in or near the foot-wall, and levels are about 100 feet apart. Drifts are either run 8 feet by 8 feet and then cut out the full width of the lode, or else run the full width at once. Then another cut is taken off the back, the drills being mounted on broken ore. There is then an opening 16 feet high for the width of the lode. The ore is drawn off, and the broken waste rock left in piles in the drift. The levels are now enclosed by "dry" walls built of rock, and a cover of lagging laid on heavy timber caps. Openings are left at intervals in the wall for chutes to draw off ore through mill holes. The mills are built up with a circular wall of rock, leaving an opening about 4 feet in diameter. Iron lips are placed at the chute, so that the ore can be drawn off from the flat bottomed mill holes into tramcars.

When walls are built and mill holes started, the remaining space is filled with poor rock. Then stoping is started, the drills being rigged up on the waste. Where the amount of poor rock broken is too small for the filling required, additional rock is broken from the foot or hanging in "poor rock stopes." The ore broken is sorted where it falls. The waste is left to fill in the stope, and the ore is thrown into, or carried in small cars to the mill holes. Stoping proceeds in this way, the mill holes being built up and the stope filled with waste while the ore is being drawn off.

When the stope has been carried up to within 30 feet of the next level, a so-called caving method is used to remove the arch. A raise is carried up to the level, and numerous holes drilled in the ground on either side of the raise. When the level is no longer needed, a wide opening is made by firing all these holes, and the waste rock filling in the stope aove follows the ore down into the stope below. The ore is sorted out and trown into the mill holes and then drills are rigged upon the waste filling in the stope, and slices are taken off the arch. When only a few feet remain a large number of holes are drilled nearly through to the level, the stope is well cleaned of ore, and then the holes fired. The broken ore falls down into the stope, and is followed by a pile of waste from the stope above. As much of the ore as possible is sorted out and thrown in the mill holes. When all readily reached is sorted out, the drills are rigged up on the side of the pile of waste and another cut is made across the lode. Then again the stope is well cleaned of ore, and the last few feet of back is drilled with numerous holes. These are fired, and another cave of waste takes place. In this way all the lode is broken and most of the ore is saved.

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[1]From Publication 8, Michigan Geological and Biological Survey. This section was written by Reginald E. Hore.

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[2]A description by W. A. Parnall, Jr., of the No. 5 Tamarack shaft was published in proceedings of the L. S. M. Inst., Vol. VII, 101, pp. 50-61.

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[3]A description of the Wolverine method will be found in Rickard's Copper Mines of Lake Superior and Crane's Ore Mining Methods.

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[4]The Quincy method has been described by T. A. Rickard in Copper Mines of Lake Superior, and by G. R. McLaren, Journal of the Canadian Mining Institute, 1907, pp. 399-417. The methods have been somewhat changed since their descriptions were written.

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[5]Diagrams illustrating arrangement for loading skip will be found in T. A. Rickard's "Copper Mines of Lake Superior," pp. 68 and 69.

# WATER POWERS IN THE PORCUPINE AREA*

By W. R. Rogers.

For the last report of the Bureau of Mines the writer prepared a few notes on the subject of water powers in the vicinity of Porcupine. This article was incorporated in Mr. Burrows' report on the Porcupine Gold Area.

Since last writing the hydro-electric plant at Sandy Falls has been completed, and electric energy supplied to the mines since June, 1911. Another water power is being harnessed at Wawaitin Falls. Both of these powers, situated on the Mattagami river at distances of 6 and 11½ miles respectively from the Hollinger mine, are shown on the geological map of the Porcupine area.

Other water powers within a radius of 25 miles from Porcupine are: High Falls on the Frederickhouse river in the Township of Mann; Grassy Falls on the Price-Fripp township boundary; and Sturgeon Falls on the Mattagami river in the Township of Mahaffy. Applications have been made for permission to develop all of these. However, no actual development work has been carried beyond the stage of preliminary surveys.

*From the 21st Annual Report of the Ontario Bureau of Mines.

A copy of the regulations stating the conditions upon which water powers are leased may be had on application to the Department of Lands, Forests and Mines.

### Importance of Accurate Data.

Hydrographic work in Canada, or rather the branch of it pertaining to stream measurements, was initiated by the Department of the Interior, Ottawa in 1909. Work, however, has been confined almost exclusively to Dominion lands in the Province of Alberta. A valuable report was issued in 1911 by the Conservation Commission entitled "Water Powers of Canada." In this volume emphasis is laid on the necessity of obtaining more accurate data in regard to water powers before proceeding with their development. The only safe basis for estimating the maximum amount of power available is the minimum flow of the stream throughout the year. In some cases storage facilities will help to raise this minimum. In order to secure the necessary data, metering and gauging stations should be established, and to ascertain the maximum, minimum and mean discharges accurate records for a period of years are necessary. The importance of winter observations must not be overlooked as the minimum flow occurs during that season and should be determined for use in considering power schemes. From the power user's point of view contracts should not be entered into for the supply of more power than is justified by low water records for a period of ten years or more. As such data respecting water powers in Northern Ontario is not available, a very conservative estimate should be made the basis of hydraulic and electrical installations.

A case in point is that of the Porcupine Power Company. Extreme low water and ice troubles in March, 1912, combined to tie up the Sandy Falls power plant and to greatly inconvenience customers. A year previous, at the Ragged Chutes compressed air plant on the Montreal river, a similar condition developed, which resulted in many of the mines at Cobalt shutting down for lack of air to run the drills. This difficulty has been overcome by the construction of storage dams to retain flood waters, in order to increase the flow at low stage periods.

The drainage area of the Mattagami river at Wawaitin Falls is approximately 1,000 square miles. At Sandy Falls the drainage area has been increased to 2,500 square miles by the additional territory supplying tributary feeders, namely, Mountjoy creek and the Grassy and Lost rivers. Assuming a run-off of 0.4 cubic feet per second per square mile, the discharge at these points would be 400 and 1,000 cubic feet per second, respectively. The effective head at Wawaitin is 118 feet, and at Sandy Falls 34 feet. Figuring on this basis and assuming for turbines 80 per cent. efficiency under natural flow, the minimum 24-hour horse-power is 4,300 and 3,100 respectively. The only definite metering records available give the following:—

Wawaitin Falls.—March 1910, 366 cubic feet per second.

Sandy Falls.—January 20th, 1910, 1,654 cubic feet per second.

A director of the Porcupine Power Company states that the extreme low water flow per second at Sandy Falls was 1,600, 1,200 and 600 cubic feet respectively for the years 1910, 1911 and 1912. It will be seen from the above records that an exceptional year like 1912 emphasizes the necessity of continuous records for a period of years to ascertain the extremes of flow as well as a reliable mean. Extreme cold weather, with no thaws of consequence throughout the winter, produces an acute situation in Northern Ontario. Controlled storage is the only remedy for increasing the minimum flow, and it is proposed to dam the headwaters of the Grassy river for this purpose. In this part of the Province of Ontario February and March is the season of extreme low water.

In the case of the Wawaitin plant, Kenogamissee lake forms a small storage basin. Kenogamissee Falls, 25 miles south, affords facilities for storage and regulation. In addition it would be possible to divert the Lost or Redsucker river by means of a small dam and a shallow cutting about 1½ miles in length through sandy soil.

### Porcupine Power Company.

The Porcupine Power Company's plant at Sandy Falls consists of two 25-cycle, 3-phase, 12,000-volt 214 revolutions per minute, 950-k.w. generators, directly connected to S. Morgan Smith turbines. A third unit of similar capacity is being installed. The electric equipment is of Canadian Westinghouse manufacture. Each unite requires 450 cubic feet of water per second to develop full power under an effective head of 34 feet.

Turbine runners are 54 inches, and intake pipe 10 feet in diameter. The turbines were specially constructed to admit of sections being teamed on sleighs a distance of 45 miles from Kelso before the Porcupine branch of the T. & N. O. railway was built. The power house is a timber structure sheeted with galvanized iron, and is equipped with a 15-ton travelling crane. The timber flume, 13 by 16 feet in section, and 700 feet long, is provided with electric heating wires running through the upright studs in case it should be found necessary to use a heating appliance to prevent ice formation in extreme winter weather.

The dam is of cribwork construction, stone filled, sheet piled, and has 10 sluice-ways, varying in width from 12 to 16 feet. Spillway, fishway, and a combination ice run and log chute are also provided.

The plant was designed and constructed by H. D. Symmes of Niagara Falls, who is a director of the Porcupine Power Company.

### Wawaitin Power Company.

Construction work at Wawaitin Falls started in the summer of 1911. Supplies, machinery, etc., were loaded on scows and pointers and towed up the Mattagami river by gasoline boats from Mattagami Landing. Messrs. Ross and Holgate, of Montreal, are consulting engineers for the company.

The Falls are in Thornloe township, their position being shown on the map of the Porcupine Gold Area. It is proposed to use a head of 118 feet, carrying the water from a higher level to a lower by means of an open flume and pipe lines. The open flume or canal is about 1,400 feet long, 40 feet in width, and the greater part is in rock. A 12-foot diameter penstock leads from the flume for a distance of 1,500 feet, where it subdivides into two, each 8 feet in diameter and 1,200 feet long. The surge tank at the junction of the penstock is 40 feet in diameter and 38 feet high. These 8-foot penstocks terminating at the power house supply two units, each Westinghouse generator being 2,500-k.w., 12,000-volts, 3-phase, 25-cycle, running 375 revolutions per minute, with an overload capacity of 3,120 k.w. Provision has been made for a duplication of the pipe line and power house installations. The power house is of reinforced cement construction, with cement roof.

The location of the dam is at the head of a small island, at the point where Kenogamissee lake contracts to river width. This dam, 1,000 feet long is provided with log chute 150-foot spillway, and has 16 stop-log sluiceways for the purpose of maintaining a uniform head above the dam.

E. A. Wallberg has leased this water power, and under the conditions must develop electrical energy to the amount of 4,000 horse-power by September, 1912. During the past winter, 1911-1912, progress has been checked for financial reasons. However, at the time of writing, May, 1912, work has been resumed and indications point to completion of the work before the time required by the lease from the Crown. An interest in the power company has been acquired by the Dome Mines, Limited. They will require 3,000 horse-power for the first year's work.

The Sandy Falls plant of the Porcupine Power Company is already taxed to the limit of its capacity, and further power must be provided to meet the demands of Porcupine mines as development proceeds.

Thanks are due Mr. Robert Laird, resident engineer of the Wawaitin Power Company, for furnishing construction data. Mr. J. H. Thornley, resident engineer of the Porcupine Power Company, kindly supplied photographs of the power house and general layout, and also explained the main features of construction.

# EAST KOOTENAY

Now that the St. Eugene mine is no longer a large producer of lead ore, much interest is taken in the Sullivan mine, to which brief references were made in several annual reports of the Consolidated Mining & Smelting Company of Canada, Limited, as follows:

### Sullivan Mine.

As at June 30, 1910: "A lease has been taken upon the Sullivan mine, near Kimberley. A royalty is paid upon all ore shipped, and the Consolidated company has undertaken to perform $10,000 worth of development work. The mine is producing monthly 2,500 tons of ore containing, approximately, lead 18 per cent., and silver 6 ounces a ton."

As at June 30, 1911: "During the year the company has acquired a majority of the stock of the Fort Steele Mining & Smelting Company, Limited, owner of the Sullivan mine. The lease to the Consolidated company expired on June 30, and the Fort Steele company is now operating the property and shipping ore to Trail. The mine is producing between 2,000 and 3,000 tons a month of ore containing, approximately, lead 20 per cent., and silver 6.6 ounces to the ton. The loss of the St. Eugene tonnage has been serious, but will be partly overcome by the operation of the Sullivan, in which the mineral-bearing area has not yet been thoroughly prospected."

As at June 30, 1912: "The properties of the Consolidated company surrounding the Sullivan group have been prospected to a small extent with a diamond drill, with promising results. The Sullivan lease having expired, the property has been operated by the Fort Steele Mining & Smelting Company, and the ore shipped to Trail for treatment. The mine shipped during the year 21,189 tons of ore, containing 205,654 ounces silver, and 10,569,211 pounds of lead."

Statistics published by the Consolidated company show that up to June 30, last, the aggregate production of the Sullivan mine had been 147,364 tons of ore, containing 1,246,023 ounces of silver, and 63,049,962 pounds of lead, together having a gross value of $3,083,655.

### Economic Geology of Kimberley Areas.

The last-published "Summary Report" of the Geological Survey of Canada includes a report by Mr. S. J. Schofield on his 1911 season's work in East Kootenay. Under the sub-head "Economic Geology" he gives the following information relative to the Sullivan and neighbouring Stemwinder mines, in the Kimberley area:

"The area is situated near Kimberley, the terminus of the Canadian Pacific Railway Company's branch line from Cranbrook to Kimberley, and includes the Sullivan, Stemwinder, North Star, and several minor properties. It is underlain by a series of argillaceous quartzites and pure heavy-bedded quartzites, which are identical in lithological and physical characters with those described in the Moyie district, and hence belong to the lowest-known subdivision of the Purcell series. About one-half mile above Kimber, on Mark creek, a few diorite sills are exposed in the valley walls.

"Sullivan Group.—This group was discovered in 1895; it is situated on Sullivan hill, about two and one-half miles by road north of Kimberley, at an elevation of about 4,600 feet above sea-level. The deposit lies in the lowest-known subdivision of the Purcell series, which here strike about north and dip from 10 to 60 degrees to the east. The country rocks consist of thin-bedded, argillaceous quartzites, and heavy-bedded, purer quartzites. The ore-body conforms in dip and strike with the quartzites and cannot be called a true fissure vein, but a replacement deposit in which the sulphides have replaced the fine-grained quartzites. The hanging and footwalls are, in general, not well defined, but the ore gradually passes into the normal country rocks so that the distinction between country rock and ore is commercial rather than structural. Exceptions to this occur where the walls consist of the thin-bedded, slaty quartzites, which are evidently difficult to replace. In the upper workings, close-folding later than the ore-deposition increases the apparent width of the deposit. On the 60-foot level the dip of the ore-body in places approximates 25 degrees, and on the 100-foot level it increases to 70 degrees, which is also the dip of the surrounding quartzites. As far as exploited, the maximum stope width is 120 feet and the maximum stope length 325 feet. There are nine levels, the deepest being 100 feet below the surface. The deposit is a lens-shaped mass, striking about north and south, with a dip to the east.

"The ore-body is arranged in distinct zones which grade imperceptibly into each other. The centre of the body is occupied by a fine-grained mixture of galena and zinc blende in which masses of purer galena occur as lenses. The gangue is absent from this inner zone, except for a few well-formed crystals of pink garnets. This inner portion gradually passes exteriorly into a fine-grained mixture of pyrite, pyrrhotite, and zinc blende which contains as a gangue numerous crystals of a clear, colorless garnet with some grains of anthophyllite and possibly diopside. The sulphides gradually diminish in amount and finally give way to a fine-grained chert which is present where the country rock is a heavy-bedded, purer quartzite, and is absent where a more argillaceous, slaty member constitutes the wall-rock. No garnets nor anthophyllite are present in this zone. The chert gradually passes into the normal quartzite. The contact minerals occur only in the ore-body and are entirely lacking in the country rock surrounding the deposit. The presenee of the minerals, garnet and diopside, so characteristie of contaet deposits, is not due to any intrusion of igneous material at present visible, for the nearest outcrop of granite is four miles away, near Wycliffe, on the St. Mary prairie. The presence of the minerals garnet,, pyroxene, and pyrrhotite warrants the conclusion that the Sullivan ore-body was formed under eonditions of high temperature and pressure, and in origin was eonneeted with some deep-seated intrusion of granite which has not yet been exposed by erosion in the neighbourhood of the Sullivan mine. The Stemwinder property, oecurring on Mark creek and apparently in a lower horizon than the Sullivan, indicates that ore-bodies might be expected below the Sullivan deposit.

"The Sullivan ore is shipped to Trail for treatment and is smelted without any preliminary concentration. Development and eonstruetion work are being rapidly earried on, and about 100 men are employed.

"Stemwinder.—The Stemwinder is situated one mile northwest of Kimberley, on Mark creek. The country rocks consist of argillaceous quartzites intruded by several sills of diorite. The ore-body is enclosed entirely by the quartzites and closely resembles the Sullivan deposit in its occurrence and mineralogy. The interior of the ore-body consists of a fine-grained mixture of galena and zinc blende passing exteriorly into a fine-grained mixture of pyrrhotite, pyrite, and zinc blende. This is sneeeeded by a cherty layer which in turn passes into normal quartzite. The amount of development so far accomplished was not sufficient to expose the relation of the ore-body, but it is evidently of large size. Three short tunnels and a shaft 75 feet deep open the deposit. Experiments are in progress to determine the best method for the treatment of this refractory ore."

# PERSONAL AND GENERAL

Mr. R. C. Sweezy has been retained by banking interests to examine mining properties. He has returned recently after spending three months in Western Canada, and leaves shortly for Mexico.

Mr. R. H. Stewart, general manager of the Consolidated Mining & Smelting Company of Canada, passed throught Montreal recently, having spent some weeks in England on business for his company. Mr. Stewart is very hopeful concerning the future of mining in British Columbia, believing that great aetivity will result directly the problem of treating the complex ores, particularly those in which zinc is a major constituent, shall have been satisfactorily solved. He is of the opinion the solution of these problems will be found very shortly.

Mr. Charles Fergie was in New York on business last week.

Dr. A. E. Barlow delivered a lecture on the Cobalt District before the New York Section of the American Institute of Mining Engineers on December 20th.

Mr. Moses Jones, assistant underground manager at the Springhill mines, Nova Scotia, was killed on December 19th by being struck by a train of cars passing up the slope.

Mr. J. H. Plummer, president of the Dominion Steel Coporation, who was interviewed in Montreal the other day, stated that conditions now obtaining in the steel trade are very satisfactory. The company has now its fifth blast furnace in operation, while the output of the nail mill has been considerably increased.

Mr. David H. Browne, metallurgist of the Canadian Copper Company, was in New York recently in connection with the arrangements now being made by the company to double the capacity of its reduction works in the early future.

Mr. Herbert Carmichael, of Victoria, B.C., for about twenty years provincial Assayer for British Columbia, has resigned that Office and will hereafter give his attention wholly to his own affairs.

Dr. De Lorme D. Cairnes, of the Geological Survey of Canada, has contributed to the "Bulletin of the Geological Society of America" a paper entitled "Differential Erosion and Eqiplanation in Portions of Yukon and Alaska."

Prof. W. A. Carlyle, professor in metallurgy at the Imperial College of Science and Technology, London, England, recently returned to that city from Mazapil, Mexico.

Preliminary announcement has been made of the intention to hold the next Annual Meeting of the Canadian Mining Institute in Ottawa, Ontario.

Mr. C. D. Emmons, under whose advice the British Columbia Oilfield, Ltd., of Vancouver has been drilling for oil on Graham island of the Queen Charlotte group, British Columbia, is convalescent after having been ill two weeks in a hospital in Victoria.

Mr. Geo. Watkin Evans, of Seattle, Washington, who had been ill after having spent the greater part of the last field season in the Groundhog eoal field, in the northern part of Skeena district, British Columbia, has now recovered his usual good health.

Mr. Henry Harris, some years ago assistant superintendent of the smelting works of the Hall Mining & Smelting Company,at Nelson, B.C., and afterwards filling a similar position at the Brown Alaska Company's smeltery at Hadley, Prince of Wales island, southeast Alaska, sends greetings to his friends in Canada from Zeehan, Tasmania, where for several years he has been manager of the Tasmanian Smelting Company.

Mr. W. Pellew-Harvey, for years activity eonneeetd with the mining industry of British Columbia, but now of Pellew-Harvey & Company, mining engineers, London, England, was recently at Tiflis, Caucasus.

Mr. W. S. Hawley of Spokane, Washington, manager of the Silver Hoard Mines Company, operating a silver mine in Ainsworth camp, British Columbia, has received from Prof. F. A. Thomson, head of the mining engineering department of the State College of Washington, Pullman, Washington, a report on that property, which during recent months has shipped to the Consolidated Company's smeltery at Trail, B.C., between 200 and 300 tons of ore averaging about 61 ounces silver to the ton and 3 per cent. lead.

Mr. Robert R. Hedley, of Vancouver, B.C., was one of the examiners at a recent examination of applicants for certificates of competency and license to practise assaying in British Columbia under the "Bureau of Mines Amendment Act of 1899."

Mr. Jules Labarthe, formely superintendent for a number of years of the Consolidated Mining & Smelting Company's smeltery at Trail, West Kootenay, British Columbia, and now general manager of the Mason

Valley Mines Company, with mines and smelting works in Nevada, when met in Spokane, Washington, recently, stated that Mr. A. J. McNab, who succeeded him in charge of the Trail works and afterward accepted the position of metallurgist for the Mason Valley Mines Company is doing excellent work in Nevada, where his company's mining and smelting enterprise is in a flourishing condition.

Mr. Douglas C. Livingston, one of the professors of mining engineering at the Idaho University, Moscow, Idaho, formerly with the Tyee Copper Company on Vancouver island, B.C., and later for several years engaged in mining in Mexico, has been taking part in a discussion, printed in "Mining and Scientific Press," of San Francisco, California, of an article on "Ore Reserves and Life Extension," contributed to that journal by Mr. Morton Webber.

Mr. R. Machin, well known in British Columbia mining districts six or seven years ago as the provincial representative of several British manufacturers of mining machinery and supplies, is again resident in Victoria after having been for a time in Western Australia on business matters.

Mr. J. W. D. Moodie, vice-president and general manager of the Britannia Mining & Smelting Company, with mines and concentration works near Howe Sound, British Columbia, has been on a visit to New York city, where are resident some of the larger shareholders in the Britannia company, the operations of which are becoming increasingly important, while its property holdings have been considerably added to of late.

Mr. M. E. Purcell, superintendent of the Consolidated Mining & Smelting Company of Canada's Centre Star group of mines, in Rossland camp, British Columbia, has returned from Spokane, and the Coeur d'Alene district of Idaho, after having attended the American Mining Congress, and visited several of the larger mines and concentrating mills in the Idaho Panhandle.

Mr. Byron Riblet, whose name is well known in British Columbia and adjacent parts in connection with the Riblet system of aerial tramways, has been granted a patent for a landing stage for aeroplanes.

Mr. James Rutherford, representing British investors in land and mining properties in Western Canada, has returned to Victoria, B.C., for the winter after having again spent several weeks in the Peace River country.

From the London "Mining Journal" it is learned that Mr. Ernest H. S. Sampson had recently been appointed assayer and surveyor for the New Canadian Metal Company, Limited, at Riondel, British Columbia. This company, of which Mr. S. S. Fowler is general manager, is working the well-known Bluebell mine, situated across Kootenay lake from Ainsworth, West Kootenay, and has, too, a well-equipped concentrating mill there.

Mr. Robert H. Stewart, of Trial, British Columbia, general manager of the Consolidated Mining & Smelting Company of Canada, Limited, who about two months ago left on a trip to Europe, is understood to have been investigating some of the zinc reduction processes in operation on that continent. Interested persons continue to make much of the allegation that the Consolidated company has purchased the Canadian rights to the French process for reducing zinc-lead ores, but so far as can be ascertained that company is doing little, if anything, towards using that process for the attempted saving of the spelter content of ores in any considerable quantity.

Several months ago the Canadian Collieries (Dunsmuir) Limited' operating the Cumberland and Extension collieries, on Vancouver island, British Columbia, created a new office in connection with their operations at Union bay, namely that of superintendent there of workshops, coal-shipping plant and appliances, coke ovens, etc., and appointed Mr. J. A. Tompkins to fill the position. There is a prospect of the company establishing a coal-briquetting plant at Union bay, and in connection with this prospective enterprise much information is being obtained.

Mr. Bruce White, for years actively connected with mining in West Kootenay district of British Columbia, has returned to that district after having spent several weeks in the provincial coast cities and in Spokane, Washington. His name was lately associated in a district newspaper with the staking of mineral claims in the vicinity of Kootenay lake, on which claims the occurrence of ore containing platinum was alleged. Mr. White himself is authority for the statement that there is still serious doubt as to the correctness of the report that platinum occurs there, as alleged, since an assayer of long experience and excellent standing has been unable to confirm assurances given by another that the ore is platinum-bearing.

Mr. W. E. Zwicky, of Kaslo, B.C., manager of the Rambler-Cariboo Mines, Limited, with a largely developed silver-lead mine in Slocan district of British Columbia, has been quoted by the Nelson "Daily News" as authority for the statement that the operation of the company's new concentration mill has been commenced. This company, after having previously sunk to a depth of 800 feet from the apex of the vein, in 1904, commenced to drive a 4,500-foot cross-cut adit with the object of cutting the vein at about 600 feet deeper. Eventually this was done, and after many delays, caused by fire and other adverse circumstances, production on a comparatively large scale is about to be begun. The vein has been explored on half a dozen levels down to the 1,400, and on each of these stoping can be done, so that there is little probability of the supply of ore running short for the next year or two.

Zinc mining is receiving increasing attention in British Columbia, and in this connection, Mr. J. L. Retallack, of Kalso acting on behalf of Messers. Beer Sondheimer & Company, with works at Bartlesville, Oklahoma U.S.A., has purchased the zinc-concentrate output from the concentrating mills of the Standard, Hewitt, and Van-Roi mines,in Slocan district, and the Monarch, near Field, on the C.P.R. transcontinental line. Other shippers are the Lucky Jim and the Noble Five both in Slocan district, the former in comparatively large and the latter in smaller quantity. In addition, there is a little British Columbia zinc ore concentrate being sent to Kansas and elsewhere in the United States.

## QUEBEC.

Some attention is again being directed to phosphate mining in the province in consequence of the improvement in prices permitting of profitable operation. At one time phosphate commanded $25 per ton, but the discovery of large and easily mined deposits in Florida reduced the price to $5 per ton, killing the local industry. The present price ranges between $11 and $14, and there is a good demand for the product. Phosphate is manufactured into fertilizer at five works in Canada, of which three are established in the Province of Quebec.

# THE SWASTIKA GOLD AREA*

By E. L. Bruce.

The Swastika gold area centres about the Town of Swastika at mileage 164 on the Temiskaming & Northern Ontario Railway. The area examined comprises the southern half of the Township of Teck and the northern half of the Township of Otto. This area was first described by Mr. W. J. Wilson, who made a reconnaissance survey of the Blanche river for the Canadian Geological Survey, and later by Mr. L. L. Bolton, who accompanied Speight's survey party in 1904 and reported on the geology of the country from Round lake to Abitibi for the Ontario Bureau of Mines.

At the time of the gold rush to Larder Lake a number of claims were staked in the Swastika area, and some work was done upon them. The claims now held by the Lucky Cross Mining Company and those of the Swastika Mining Company were located at that time. In the depression which followed operations were continued only on the latter group. The first development was done on the big quartz vein on the west side of Otto lake. A shaft was put down about sixty feet and some drifting done. Surface prospecting on the north side of the lake uncovered No. 1 vein, containing visible gold, and with the discovery of other veins near this one the work on the west side was abandoned. A shaft was sunk and a five-stamp mill was installed on the north side. This mill turned out several small bricks before being dismantled in 1911 to make room for the present plant.

The discovery of gold at Porcupine led to renewed interest being taken in the older area, and the summer of 1911 saw most of the old claims restaked and development work started on many properties.

## Topography and Drainage.

The area lies just south of the height of land between James Bay and the Ottawa river, and while the difference of elevation is seldom more than two hundred feet the country is rather rugged and broken. Rock outcrops are numerous, and the areas of swamp are neither large nor continuous. The hills are arranged in roughly parallel east and west ridges in conformity with the strike of the formations. East of the Blanche river, however, the regularity is not so pronounced, and the hills are more or less isolated.

The Blanche river which flows through this area, turns sharply east about a mile below Kenogami station and runs between two of these ridges until it breaks across the southern one in a series of rapids at Swastika. Just south of these rapids it is joined by Amikougami creek, which forms the outlet of Amikougami lake north of Swastika, and which flows in a fairly straight north and south course. Below the junction of the two streams is a broad valley, in which the river meanders considerably before entering Otto lake. Leaving the lake, the river again forms a series of rapids, below which there is a long stretch of quiet water broken only where it crosses the syenite ridge in concession IV. In concession V. the Blanche receives another tributary from the north, known as Murdock creek. This stream, like Amikougami creek, flows south in a fairly straight course. The lower part is shallow and rapid, but the upper reaches are rather sluggish. The Amikougami is broken by a few rapids but forms a good canoe route to the lakes lying to the north.

*From the 21st Annual Report of the Ontario Bureau of Mines.

## Geology.

The rocks of the area may be classified as follows:—

Recent and Glacial—
Stratified clays, peat, sand and gravel.
Pre-Cambrian—
Post Huronian—Diabase, red feldspar-porphyry, augite, lamprophyre.
Igneous Contact.
Huronian—Conglomerate and greywacke.
Unconformity.
Laurentian—Augite syenite.
Igneous Contact.
Keewatin—Gral feldspar-porphyry basic intrusives, iron formation and epidotic rocks, greenstones and schist.

### Keewatin.

**Greenstone and Greenstone Schist.**—The greater part of the Keewatin rocks are massive greenstones or their schistose derivatives. Where stil massive, the greenstones show an ellipsoidal structure. This characteristic is pronounced in the rocks of the northeast corner of Otto. It is also seen especially well on the hill to the east of mile-post 170, and on the face of the cliff near Kenogami station. Massive greenstones grade into rocks of schistose character. The schistoity become more pronounced near the contact with the later acidic intrusives, and the strike of the schists is usually parallel to the strike of the contact. The layers of schist are not at all regular, but often the rock shows a columnar structure, with twisted blocks whose surfaces are serpentinized and highly polished. Rocks of this type outcrop along the railroad east of Amikougami creek. Between this stream and Murdock creek, railroad cuttings show an anticlinal arrangement of these schists. At the western side they have a strike S. 45 W., dip 70 degrees N.W. The dip gradually becomes less steep, until the schists are almost flat. Then the dip increases towards the S.E., and at a point two miles east of Swastika the strike is S. 64 degrees W., dip 80 degrees S.E.

The greenstones and schist extend in a broad belt across concessions IV., and V., Otto and after crossing the Blanche river at Swastika the northern boundary follows Amikougami creek for some distance, and then swings northeast across the southern part of the Township of Teck.

A chistose greenstone east of Swastika consists entirely of actinolite needles, along with sericite and magnetite. A rather more massive rock at the west end of Pike lake has altered to chlorite, with a considerable quantity of carbonates, and has fine particles of sulphides scattered through it. In neither case is any trace of the original structure or minerals left.

At mileage 162 on the Temiskaming & Northern Ontario Railway there is a cutting through a very dense black basaltic looking rock that carries many small lenses of sulphides. Under the microscope the rock shows grains of quartz and a dark sooty material. The rock suggests a baked bituminous shale.

**Carbonate Rocks**—Carbonates occur at several places in the area. Along the north side of Pike lake a narrow more or less continuous band of a much rusted carbonate rock separates the conglomerate from the grap feldspar-prophyry. This band is so altered and its character so masked by the rusty weathering that it is impossible to determine its original nature. In parts the unweathered portion is light green in colour, probably consisting largely of the chrome-bearing mica, fuchsite. Carbonate rocks also outcrop farther west, in lot 12, concession VI., Otto. They are fractured and the fractures are filled by quartz, producing a network of intersecting veinlets. Other small outcrops of carbonate rocks occur in the eastern part of Teck.

**Serpentine.**—The greenstones are often much serpentised along slip planes and on the surfaces of the layers of schist. An outcrop of massive serpentine of small extent was observed on the Crawford claims, about two miles north of Swastika.

**Iron Formation and Epidotic Rocks.**—Banded iron formation, consisting of alternate bands of magnetite and silica, occurs at several points along the southern edge of the Keewatin belt. A rock that seems to be related to it is exposed in the railway cuts in concession V., Otto. This rock consists of interbanded epidote and silica. Iron formation lies a few chains farther south.

**Keewatin Intrusives.**—A large number of dikes of varying character cut the Keewatin greenstones. Some of these are so much altered that they suggest very early intrusions, and probably belong to the latter part of the Keewatin complex. Others, however, are much fresher, and may be of much later date. These are relatively small in area and have been mapped as Keewatin, since their relationship to later rocks is not known.

Diabase dikes are very numerous in the greenstones. In most cases the rock is very badly altered, and there is little doubt that it belongs to the Keewatin complex. Other dikes are, however, quite fresh in appearance, and some of these may belong to the post-Huronian series but at no place was any intrusion of diabase into conglomerates or greywackes observed. A considerable area of a massive igneous rock outcrops in concession V., lots 1 and 2, of the Township of Eby. It is somewhat altered, but still retains phenocrysts of a bronzy colour. Farther north a thin section shows a rock that has evidently resulted from the metmorphism of an igneous rock of a porphyritic type. Some original minerals are still recognizable, and the original structure is not much affected. Feldspar phenocrysts are present and can still be determined as near albite in composition. A few shreds of green hornblende are left, but most of this mineral, which apparently formed the largest number of phenocrysts, has changed over to chlorite. Sericite is also abundant due to the alteration of the feldspathic constituents.

**Feldspar-Porphyry.**—Intruding the greenstones near Otto lake and again on the eastern side of Murdock creek is a gray feldspar-porphyry, which has been included in the Keewatin series. The feldspar phenocrysts show distinctly on the surface. Under the microscope the rock is distinctly porphyritic. The phenocrysts are blagioclase feldspar, near the albite end, set in a groundmass of quartz, feldspar, and hornblende. Considerable alteration has taken place, producing chlorite, sericite, kaolin, carbonates and epidote. Magnetite and chalcopyrite are present. The phenocrysts make up a large part of the rock, the areas of groundmass being narrow.

A thin section of the rock in the railway cut near the water tank at Swastika shows a rather abnormal facies of this rock. Here the ferro-magnesian minerals are altogether lacking, the whole rock consisting of albite, quartz and alteration products such as carbonates, sericite, chlorite, epidote and magnetite. The ordinary type is a quartz diorite-porphyry. This abnormal type approaches a quartz keratophyre.

**Hornblendite.**—Crossing the eastern boundary of Teck is an outcrop of porphyritic hornblendite. It is roughly elliptical in outline and is entirely surrounded by drift, hiding the contact with the Keewatin rocks around it. Near the centre of the exposure, the hornblende crystals are large, often being an inch in diameter, and the whole rock consists of dark minerals. Towards the margin it becomes finer grained, and more light coloured constituents appear. The rock is made up of phenocrysts of green hornblende and brown biotite, with a little magnetite, apatite and titanite. Inclusions of light pyroxene, of the variety diopside, occur in the hornblende crystals. There is very little alteration, and the hornblende is undoubtedly primary. The little secondary material present is epidote apparently from feldspar. The unaltered character of the rock suggests that it may be much later than the Keewatin series, possibly a basic segregation from one of the acidic intrusives.

**Other Intrusives.**—Many other smaller dikes cut the Keewatin at different places in the area. Basaltic dikes from an inch up to sixty feet in width are to be seen in the railroad cuts east of Swastika. In one of these cuts a dike of andesite-prophyry six feet in width intrudes the serpentinized greenstones. It has a very striking porphyritic structure. The phenocrysts are feldspar and hornblende. The former are well bounded tabular crystals of albite showing zonal structure. The hornblende is of the ordinary green variety, occurring in prismatic crystals much elongated. Cross sections of these have diamond shaped or hexagonal outlines, and some of the crystals show distinct zonal growth, an uncommon feature in hornblende. Fragments of biotite, now light green in colour from alteration, and, in some places, completely altered to chlorite and magnetite, occur. Apatite is also present.

A dike of similar rock but showing more alteration occurs on the Reeves claims north of Pike lake. This dike is cut by a narrow mica-lamprophyre consisting almost entirely of greenish biotite, with a little magnetite.

### Laurentian.

All those rather fresh, acidic rocks of the area, whose relationship to the conglomerate is not known, are included in the Laurentian series. In the northwestern part of the district conglomerates were found overlying acidic igneous rocks, although not directly in contact, and containing pebbles very similar to the underlying formation. In other places no relationship was observed. The character of the feldspar, and the presence of augite in the syenite classed as Laurentian, suggests that it may be one member of a series of differentiation products of a parent magma, of which red feldspar-porphyry and augite-lamprophyre, to be described later, are other facies. In the absence of any observed field relationship, however, it has been mapped as Laurentian.

There are three areas of such rocks in the district. The largest of these forms a prominent ridge lying between concession 4 and 5, Otto, and extending east and west. A boss-like mass intrudes Keewatin rocks north of the railway with its centre in H. R. 737. The third is a small exposure south of Perron lake, in the northwestern part of the area.

The contact of the first of these with the Keewatin can be seen in the western part of the township, forming a broad zone. Towards the centre and east, however, the Laurentian ridge is separated from Keewatin rocks by a wide drift-filled valley. The rock consists largely of feldspar, and is often very coarse in grain, the feldspar reaching a diameter of an inch or more. The coarse grained rock is cut by finer grained stringers of the same character, excepting for the size of the constituents. These withstand weathering rather better and stand out from the surface. The cleavage of the feldspars causes the rock to break down rather easily. In thin section the rock exhibits a tendency towards porphyritic structure. It consists of feldspar, augite, biotite, hornblende, magnetite, zircon, apatite and titanite. Quartz is present in the small areas of groundmass that separate the feldspar phenocrysts, but is not very abundant. Chlorite, epidote and secondary hornblende occur as alteration products. The augite is the oldest of the more important constituents, occurring as well formed crystals (Fig. 3), and sometimes as inclusions in the feldspar. The pyroxene is often fringed with uralite. The most striking characteristic of the rock sections is the structure of the feldspar. It has a peculiar ragged, almost brecciated, appearance, which seems to be due to a crude micro-perthitic intergrowth.

The rock is essentially an augite syenite-porphyry.

The second Laurentian area consists of syenitic rocks of similar character, but the feldspars do not attain so large a size. The rock of the third area is not so coarse in grain as that of either of the others, and shows a more distinctly porphyritic texture.

### Huronian.

Huronian rocks occupy the western part of the township of Teck from the boundary line north to the limits of the map sheet and east as far as Swastika. Northeastward from Swastika the contact with the Keewatin is along the course of the Amikougami creek. It then swings eastward again. The Huronian forms a rather high area, rising gently to the north for a mile and a half from the Blanche river, and then breaking into a series of east and west ridges.

For the most part, the series consists of conglomerate and greywacke. These are fresh and unsqueezed away from the contact, but along the borders of the formation, the rock is a slate standing at a high angle and much rusted and altered. At a short distance from the contact, a conglomerate and greywacke are quite fresh in appearance. It may be possible that the highly titled slates represent a series older than the fresher conglomerate, or the relation of the Huronian to the Keewatin may be that of a fault contact.

The conglomerate is massive and shows no bedding. It varies considerably even in short distances, being crowded with pebbles at one place, while a few feet away pebbles are so rare that only careful search will reveal them. Most of the pebbles are well rounded, evidently water worn, fragments of feldspar-porphyry, similar to the gray feldspar-porphyry already described. Reddish, felsitic pebbles also occur and a few pieces of granite were found. Greenstones are common, and fragments of smooth serpentinized rock like that east of Swastika also occur. The most striking constituents of the conglomerate, although less in number than the others, are the pebbles or jasper varying from the size of a pin-head or less up to a diameter of four or five inches.

Where pebbles fail, the rock passes into a typical massive greywacke. Near the western boundary of Teck, the typical greywacke grades into a reddish coloured rock of an arkose type. Thin sections of a typical variety show fragments, most of which are porphyry, with feldspar or green hornblende phenocrysts. Along with these are fragments of minerals, consisting of albite, quartz, hornblende and magnetite set in a matrix of finer material of the same kind. Secondary minerals, chlorite, sericite, and kaolin are present.

### Post-Huronian Intrusives.

There are at least two igneous intrusives that are later than the sedimentary rocks. These are of distinct types and their relation to each other is not known. Both occur as dikes cutting greywacke and conglomerate, and sometimes as masses of considerable area.

One of these is a light reddish rock with a tendency to develop feldspar phenocrysts. A small knob of this rock is encountered in the first railway cut west of Swastika. It extends but a short distance south of the railway, and sends off a tongue along the base of the hill of conglomerate that rises south of the right-of-way. The conglomerate along the contact is considerably altered and the pebles squeezed and drawn out. East of Amikongami creek is another small exposure of similar rock, and on the Costello claim a small exposure of greywacke is cut by at least three different dikes of this rock. Many other small dikes of the rock occur at different places in the conglomerate.

A specimen from the cut west of the station shows under the microscope a rather granitoid texture, and consists almost entirely of an acidic plagioclase feldspar with a considerable quantity of secondary products. Dolomite is the chief of these, occurring in small rhombohedrons massed together, or in veinlets through the feldspar.

Aggregates of epidote and other secondary minerals are present and a little chalcopyrite is scattered through the section.

The small quantity of orthoclase probably unites with some of the soda to form anorthoclase. Hornblende does not occur in the sections examined, and that shown in the norm represents minerals such as epidote, chlorite, and other secondary products.

**Augite Lamprophyre.**—The other post-Huronian intrusive is basic in character. It is black and weathers with a pitted surface. On a fresh fracture it sometimes shows a faint purple shade. Parts of the rock show aggregates of secondary minerals which give it the appearance of having an amygdaloidal structure. This general character suggests rock of the Keewatin complex, but on a small point on the south shore of Elsie lake, near the west end, a narrow dike of this rock striking northeast cuts the greywacke. Other dikes of the same rock occur at points on the trail north to this lake, and some of these include fragments of Huronian in them.

On the north bank of the Blanche river in the township of Eby, augite lamprophyre forms the face of the high bluff for some distance. The contact is on the top of the ridge and near it the lamprophyre is bracciated and recemented by the same kind of rock.

Thin sections show numerous phenocrysts of augite set in a groundmass made up of needle-like feldspars and smaller augite crystals. Magnetite is scattered throughout in considerable quantity, also apatite, both as inclusions in the phenocrysts and the groundmass. Chlorite and epidote occur as alteration products. The augite is green in colour and occurs in well formed blocky crystals (Fig. 5 and 6). The feldspars are too small to be determined optically. The apparently amygdaloidal portions mentioned before are areas of secondary minerals, but they seem to be replacements of certain parts of the rock rather than fillings of vesicular spaces.

Since the kind of feldspar could not be determined, the relation of augite to anorthite as calculated may not represent the true proportions of the rock.

### Pleistocene and Recent.

The Pleistocene is represented only by unsorted sands and gravels, and these do not exhibit great development in the area. Since Pleistocene time the streams have formed alluvial plains in favourable places along their valleys. The largest of these is along the Blanche river in concession 5, Otto. In the swampy and marshy areas between the rock exposures peat has formed to some depth. South of the area, towards Round lake, the Pleistocene and recent deposits are a much more important formation.

### Economic Geology.

The rocky and broken character of the country makes it quite unsuitable for agriculture, excepting in the limited areas where streams have formed alluvial flats. Farther south, near Round lake, some farms have been taken up.

Fires have destroyed the original forest, but the part north of the Blanche river supports a considerable second growth, mostly of birch and poplar. This is rather light near the river, but becomes denser farther north.

### Gold.

Visible gold occurs in quartz veins in at least two parts of the district. One lies near Otto lake and includes the Swastika mine and the Reeves claim. The other lies east of Amikougami creek, on the Lucky Cross Mining Company's claims.

The veins are of the usual rather lenticular type, as a rule with steep dips. The quartz is of the white crystalline variety, with dark streaks showing in it. A slight fracturing follows the first quartz deposition, and tiny veinlets of a more transparent variety cut across the older quartz, like water lines on paper. Sulphides occur in the veins, as chalcopyrite and pyrite. The gold is very often associated with the sulphides or with the dark lines in the quartz, but occasionally is found in the clear quartz. On the Swastika claims the veins cut greenstone and gray feldspar-porphyry. On the Reeves and neighboring claims the wall rock is feldspar-porphyry and the rusty carbonate rock. The relationship on the Lucky Cross veins is similar to that on the Swastika. The porphyry is in small dikes and sometimes forms one wall, occasionally for a short distance both walls, of the vein, which does not seem to vary with change of country rock.

Veins of very similar physical characteristics are found in the conglomerate and greywacke, but, so far as known, no values have been found in them. It may be possible that they are of different age than the veins found in the Keewatin rock, or, if of the same age, the Keewatin rocks have favoured precipitation of values where veins cut them. If the latter explanation is correct, it seems likely that the fracturing of the rock and deposition of the vein material and gold values is due to the post-Huronian intrusive rocks, and probably more to the acidic type than to the augite-lamprophyre.

### Active Properties.

The Swastika Mining Company has done most of its development work on three veins on the north side of Otto lake. The largest of these is eight to nine feet wide, striking north and south. This is intersected by two other veins, the smaller having eight to nine inches of quartz. Most of the ore already stoped has come from the large vein above the thirty-five-foot level. The mine now has a three-compartment shaft down two hundred feet, the old shaft being used merely for ventilation. Considerable drifting has been done. A new equipment has been installed, consisting of two 125-horse power Jenckes boilers, a 10 by 12 double drum hoist and a 12-drill Sullivan compressor.

On the Reeves claims north of Pike lake, two veins, eight and nine feet wide, have been stripped for a hundred feet or more. These veins strike N.E. and S.W., and are about fifty feet apart. In the larger of the two, visible gold occurs at its junction with the small quartz vein.

On the Lucky Cross claims visible gold was found first in a small vein that shows in the railway cut just east of Amikougami creek. North of the right-of-way this vein is about eight inches wide and carries visible gold in a band crossing the vein at an angle from wall to wall. Later prospecting has uncovered other veins north of this, one of which has a width of twelve feet. A plant including a 6-drill compressor has been installed.

The Homestead Mining Company has a vein in the rusty carbonate rock near the Huronian contact, on which they are driving an adit into the hill.

The observations on the area were made under the general supervision of Mr. A. G. Burrows, who spent a few days with the writer in the field. Mr. R. M. Smith acted as assistant during the season. Valuable advice and assistance in the petrographic determinations were received from Prof. C. P. Perkey, while the data were being worked up in the Department of Geology and Mineralogy at Columbia University.

# SPECIAL CORRESPONDENCE

## ONTARIO.

### COBALT, GOWGANDA AND ELK LAKE

**ORE SHIPMENTS OVER THE T. & N. O. RY. FOR THE MONTH OF NOVEMBER, 1912.**

**Cobalt Proper—**

| Mine. | Tons. |
|---|---|
| Beaver | 64.37 |
| City of Cobalt | 42.00 |
| Cobalt Lake | 151.43 |
| Crown Reserve | 19.61 |
| Coniagas | 215.38 |
| Cobalt Townsite | 87.65 |
| Hudson Bay | 93.26 |
| Kerr Lake | 92.00 |
| La Rose | 260.62 |
| Nipissing | 31.62 |
| McKinley-Darragh | 135.44 |
| O'Brien | 64.79 |
| Penn Canadian | 34.46 |
| Peterson Lake (Seneca Superior) | 191.63 |
| Temiskaming | 66.22 |
| Trethewey | 58.00 |
| | 1,608.48 |

| | |
|---|---|
| **Gowganda—** | |
| Millerett | 10.00 |
| Silver ore shipments, total | 1,618.48 |
| **Iroquois Falls—** | |
| Alexo Mine( nickel) | 300.65 |
| Total | 1,919.13 |

Silver ore was shipped as follows: Canada, 31.86 per cent.; United States, 68.14 per cent.

**Fire Losses.**—Two companies lost their plants by fire during the past two weeks. The Seneca Superior, after shipping five cars of ore, one high grade and four low, had the misfortune to lose the whole of their surface equipment and development, will be delayed a little. The other victim was the Twentieth Century, a little company operating a small plant on some claims between North Cobalt and Cross Lake. Two years ago it is stated a diamond drill core contained high silver values, and they were cross-cutting for the vein when the catastrophe occurred. Both plants will be re-built.

**Mutual Benefits.**—It is probable that La Rose will benefit almost as much by the discovery of another vein of high grade ore on the Right-of-Way, as the Right-of-Way itself since the vein has been drifted on right up to the boundary and here it is three or four inches wide and high grade. The Right-of-Way is drifting to tap it at the 140-foot level, while the La Rose is also cross-cutting for it. They cannot fail to find it and should have an entirely new ore shoot about 100 ft. long on their own property.

**Buffalo Property.**—The Buffalo mine has already made three "pours" from the new high grade mill, and the mill seems to be working efficiently with the least possible delay. The third "Pour" just shipped to England consisted of 64 bars of bullion, containing 60,628 ounces of silver worth at the market $38,500. In the last three months the Buffalo has produced more ore than at any previous time in its history. Everything is now being converted to bullion, both the concentrates from the mill and the high grade, hand-picked from the stopes. The new vein at the 460-foot level of the Beaver mine is improving as more work is done on it. It has now widened to four inches of high grade ore. It is in virgin country and open possibilities for country that has not heretofore been considered favorable for prospecting.

**Lake Rumours.**—It is stated that an English syndicate connected with the same group operating the Cobalt Townsite and the Casey Cobalt has taken options on a large quantity of stock of the Cobalt Lake Mining Company. The options extend over a period of thirteen months and prices vary from 43 cents for the first twenty per cent. to slightly more than par. The Casey Cobalt will resume shipments as soon as the roads between the mine and the railroad are good for sleighing. Considerable shipments from mill and mine should be made before the end of the year.

**Sterling Silver.**—The Sterling Silver Mines, Limited, has just been organized with a capital of $1,500,000. They will take over the Haentchel claims on Hubert lake, near Elk lake, and will commence operations at once. It is stated that $13,000 has been spent on these claims already.

**A Slow Start.**—The big low grade mill at the Nipissing dropped only ten to thirty stamps in November and will not add very materially to the Nipissing total this year. In prospecting at the old Kendall vein another good shoot of high grade ore has been cut and is now being drifted on. Under the open cut at the Little Silver vein an ore shoot one hundred and fifty feet long has been opened up. The vein is very high grade, but only an inch wide. In the intermediate raise at the 64 shaft the vein where it is now being stoped shows twelve inches of high grade ore. As a direct consequence of the new vein on the Seneca Superior lease the Nipissing is sinking its old 86 shaft in order to cross-cut the territory in the vicinity, for this vein. All the silver shipped last month was in the form of bullion.

**Gillies Limit Active.**—There is considerable activity on the claims staked in August in the Gillies Limit, all prospectors believing now that the danger of dispute is past. So far there has been no find of any magnitude. On the Ryan claim some leaf silver has been discovered in a heavy smaltite and niccolite vein, but that is the extent of the bag so far.

**However, They Are Found.**—Two prospectors have set up with a team of dogs for Moose Factory, where they hope to hear tidings of the Donaldson party. Some six or seven members of this party (Cobalt men in charge of a McGill graduate) should have been out some months ago. It is hoped that they are safe at Moose Factory waiting for the ice to become safe on the Mattagami River, but their friends are nervous. They were last seen at Great Whale River on the east shore of Hudson's Bay and they were then making their way south in a sail boat.

## PORCUPINE AND SWASTIKA

**Strike Dragging.**—The strike still trails its weary length. For the most part, under the protection of the Provincial Police, the mine operators have been enabled to get in strike breakers, but in several occasions the strikers have induced them not to go to work. The McIntyre mine thus lost most of a shipment of men. The Hollinger has now almost a full complement of men, but the efficiency of the miner who has taken the place of the striker is not very high. However, both mine and mill are running and will no doubt do so. At the Dome the effects of the strike are vanishing. Under a strong guard of private detectives the pipe line from the Dome mill to Porcupine lake is being laid. Otherwise work is going ahead much as usual and as a matter of fact owing to the running into a patch of high grade ore the bullion shipment for November was higher than for any previous month in the history of the Dome. The Pearl Lake, Three Nations, and Schumacher have made their peace with the union and are working. The Dome Lake has a full force of carpenters at work on the mill and the McEaneny are also proceeding rapidly with the work of construction interrupted by the strike. Nowhere apart from the Dome and the Hollinger is there much attempt to continue underground work, with the exception of the McIntyre, and here, too, the chief desire is to complete the new mill. The Vipond, Jupiter, and Plenaurum have allowed their workings to fill up and have resigned themselves to a winter of idleness and no doubt if a settle is not soon effected, others will follow their example. The strikers are no longer molesting workmen engaged in assessment and in this respect the camp is quite active. It would have been very active, indeed, but for the strike. All the cases brought against the Hollinger workmen under the Lemieux Act, have been put over until January 6. A number of men on both sides have been fined for minor acts of violence and the situation is generally very peaceful. The chief sufferers by the strike are undoubtedly the merchants in the settlements at Timmins, Schumacher, and South Porcupine. They were just beginning to recover after a very slow summer and this setback will be fatal to many of them. Hundreds of the best miners have left the camp.

**Tough.**—Mr. C. A. Foster, who is operating the Tough claims near Kirland lake, Swastika is assembling a carload of high grade gold quartz ore for shipment. It is understood that twenty tons will be sent out at the end of this week or the beginning of next. The shipment will certainly cause considerable interest, and as it will be the richest shipment of gold quartz ore that has ever left the north country for a smelter. The vein still looks very good where the ore has been open cut and work is proceeding, a shaft being sunk in order to cut the vein at depth. There are also other properties that exhibit indications of making good around Kirkland lake. Jim Hughes and Sandy McIntyre, who are working the Reamsbottom claims state that they have opened a fine looking vein eight feet wide. The assays are said to be good.

**Morrisette Township.**—Claims in Morrisette township, east of Kirkland lake, owned by Dr. Dorsey and Dr. Fisher, of New Liskeard, have been optioned to a syndicate who are bound under the agreement to spend a considerable sum of money on them to open them up.

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It is said that the result of diamond drilling at some of the properties of the Dane Mining Company, between Dane and Swastika, has not been unfavorable, and it is understood that mining operations which were suspended for some time will be resumed for the winter.

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The Alexo mine at Iroquois Falls continues to output a good tonnage of nickel each month. Last month there was despatched over 300 tons. A small plant will be installed this winter, all the work so far being done from the surface and by hand.

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## BRITISH COLUMBIA.

With December half gone at the time of writing, and the chief interruption in the mineral production of the year being only the strike of coal miners at the coal mines, on Vancouver island, of the Canadian Collieries (Dunsmuir), Limited, there appears to be good reason for thinking that the estimate of total value of the year's production, as printed in The Canadian Mining Journal of June 15, last (see p. 446) will be found to have been a reasonable one—in fact, it is quite probably final returns, to be received during the first quarter of 1913, will show that it was somewhat under what the actual total value will have been. In detail the estimate will be too high in regard to some of the minerals, but this has been compensated for by a larger production of others than was expected, or possibly a little higher average price. The position appears to be, however, that the total value, then placed at $31,500,000, will have been reached, and probably passed.

### SOUTHEAST KOOTENAY

The following news notes of Southeast Kootenay have been taken from the "District Ledger," Fernie, Crow's Nest Pass:

The C.P.R. are keeping Corbin stocked with cars, and the mines are turning out more coal than ever, which speaks well for the quality of the coal being dug at present.

The employees of Michel collieries have decided to ask the chief inspector of mines to appoint inspection committees for the various mines in Michel.

Norman Henderson, master mechanic at Michel, has resigned his position. He has some good positions offered elsewhere, but as yet has not made up his mind where to go.

Mr. P. L. Naismith and Mr. Lewis Stockett, of the C.P.R. Department of Natural Resources, were in Hosmer from Calgary recently.

Surveyors working under instructions from Mr. Jas. T. Laidlaw, Cranbrook, have been surveying claims in the Flathead district for Mr. John Livingstone, Cranbrook, and a lot of the McLean properties situated in the valley.

The British Columbia Oil and Coal Development Company is still hard at work freighting its boring apparatus into the Flathead country, where its property is situated, up in Sage Creek district.

It is looking promising for a railway being built and a mine or two opened next year. The Southeast Kootenay Railway, which may be better known as the Davis Railway, is going ahead. Mr. Simonds is in charge out at the townsite, where they have built some fine shacks for their camp for the winter. They are going to cut the right-of-way of the railway throughout the winter. Mr. Jas. Macdonell, "Big Jim," has the contract, and his teamster, who has had charge of the freighting for the last three or four months, has got in a full supply of stores, ta last all winter.

### AINSWORTH DIVISION

The Eureka group, situated about a mile and a half north of Sproule, a stopping place on the Kaslo and Slocan Railway, is being worked by the Eagle Lode Mining Company, of Spokane, which company is stated to have spent on the property during the last twelve months about $15,000. Work under the present auspices was commenced about November, of 1911. Six men are employed now, and it is intended to work throughout the winter. The Eureka camp is about 3,000 ft. above the railway, and 6,100 ft. above sea-level.

After driving a cross-cut tunnel 340 ft. to the vein, and then drifting 100 ft. on the vein, the company put in track and prepared to work the lower tunnel of the old workings, from which a drift had been driven 200 ft. Work has had to be suspended in these old workings for the winter, but will be resumed next spring. Meanwhile development is being continued in the new workings. It is intended to next year make such arrangements as will permit of work being carried on in both old and new parts of the mine—in winter as well as in summer. There is reported to be here a well-defined vein of high grade silver-lead ore, two to eight ft. in width traced for 4,500 ft.

### SIMILKAMEEN

The Hedley Gazette has lately been reprinting a description of "B. C.'s Banner Gold Mine"—the Nickel Plate group, near Hedley. Concerning haulage of ore, it says: "The ore is loaded into two-ton cars in the mine and hauled from the stopes about two miles on an electric railway, 3-ft. gauge, in trains of about 25 tons each; maximum grade, 5 per cent. The electric locomotive weighs 10 tons. The ore is then dumped by automatic dumper into the ore-bin at the head of the gravity tramway, which is a three-rail tramway, about 10,000 feet long, and the difference in elevation between the upper and lower terminals is about 4,000 ft. The loaded skip of seven tons going down draws the empty skip up. The tramway is operated in two sections by two men who handle about 200 tons in eight hours. This is probably one of the longest three-rail gravity tramways in the world. It is operated continuously throughout the winter."

# STATISTICS AND RETURNS

## COBALT ORE SHIPMENTS

The shipments from the Cobalt camp for the week ending December 27 were:

| | High. | Low. | Tons. |
|---|---|---|---|
| Townsite | 2 | .. | 121.17 |
| La Rose | 1 | 2 | 121.17 |
| Cobalt Lake | 1 | .. | 30.10 |
| Nipissing | .. | 1 | 43.97 |
| Crown Reserve | 1 | .. | 19.94 |
| Trethewey | 1 | .. | 27.01 |
| Buffalo | 2 | .. | 59.71 |
| Colonial | 1 | .. | 23.33 |
| Wattlaufer | 2 | 1 | 50.00 |
| Peterson Lake (Seneca-Superior lease) | .. | 1 | 41.18 |
| Drummond | 1 | .. | 30.08 |
| Bailey | 1 | .. | 20.00 |
| Total | 13 | 5 | 534.24 |

Bullion shipments:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 58,464.00 | 36,756.00 |
| O'Brien | 15,736.00 | 9,722.00 |
| Buffalo | 10,550.00 | 6,600.00 |
| Miller Lake, O'Brien | 946.00 | 788.00 |
| | 85,696.00 | $53,866.00 |

## B. C. ORE SHIPMENTS

Ore production for the week ending December 21st totalled 53,064 tons, an increase of about 1,000 tons over the previous week, making the output for the year to date 2,478,767 tons. Smelter receipts for the week were 45,749 tons, and for the year to date 2,202,872 tons.

The Rio mine in the Slocan, which is being operated by a Spokane company, under the management of W. E. Zwicky, of the Rambler-Cariboo, made its second shipment of the year, sending 12 tons to the smelter. With a shipment of 97 tons the Rambler-Cariboo appeared on the list after having been absent for several weeks.

Among the Sheep Creek district silver-lead mines the Emerald and the Hudson Bay resumed shipments, the former sending 104 tons to the smelter. Roads throughout the district are now said to be in excellent condition for sleighing and ore shipments are consequently expected to increase materially in the next few weeks. Rawhiding is commencing. Ore production in detail:

| | Week. | Year. |
|---|---|---|
| **Boundary.** | | |
| Nickel Plate, milled | 1,500 | 74,600 |
| Jewel, milled | 200 | 3,800 |
| Snowstorm | 219 | 883 |
| Ben Hur | 381 | 883 |
| Jewel | 31 | 31 |
| Knob Hill | 26 | 2,148 |
| Granby | 24,040 | 1,232,650 |
| Mother Lode | 7,268 | 362,491 |
| Unnamed | 28 | 11,041 |
| Rawhide | 6,075 | 250,379 |
| Napoleon | 599 | 13,705 |
| Other mines | .... | 29,301 |
| Total | 40,367 | 1,981,898 |
| **Nelson.** | | |
| Queen Victoria | 181 | 394 |
| Granite-Poorman, milled | 250 | 13,600 |
| Mother Lode | 500 | 15,250 |
| Queen, milled | 400 | 14,500 |
| Milly Gibson, milled | 300 | 9,000 |
| Second Relief, milled | 250 | 6,500 |
| Hudson Bay | 31 | 299 |
| Second Relief | 34 | 106 |
| Yankee Girl | 79 | 587 |
| Emerald | 104 | 1,546 |
| Other mines | .... | 9,891 |
| Total | 2,129 | 71,673 |
| **Other Kootenay Mines.** | | |
| Nettie L. | 27 | 27 |
| Other mines | .... | 284 |
| Total | 27 | 311 |
| **East Kootenay.** | | |
| Monarch, milled | 425 | 12,925 |
| Sullivan | 464 | 29,988 |
| Other mines | .... | 2,313 |
| Total | 889 | 45,226 |
| **Slocan and Ainsworth.** | | |
| Total | 4,244 | 143,386 |
| **Rossland.** | | |
| Le Roi No. 2, milled | 300 | 10,100 |
| Inland Empire, milled | 90 | 2,250 |
| Nickel Plate | 27 | 102 |
| Centre Star | 3,140 | 154,869 |
| Le Roi | 953 | 43,912 |
| Le Roi No. 2 | 628 | 24,835 |
| Other mines | .... | 265 |
| Total | 5,408 | 236,333 |
| **Consolidated Co.'s Receipts.** Trail, B.C. | | |
| Total | 7,558 | 312,838 |
| **B. C. Copper Co.'s Receipts.** Greenwood, B.C. | | |
| Total | 14,151 | 657,384 |
| **Granby Smelter Receipts.** Grand Forks, B.C. | | |
| Granby | 24,040 | 1,232,650 |

### SILVER PRICES.

| | New York. Cents. | London. Pence. |
|---|---|---|
| December 7 | 64⅛ | $29\frac{11}{16}$ |
| December 9 | .. | .. |
| December 10 | 64⅛ | $29\frac{11}{16}$ |
| December 11 | 64 | 29⅝ |
| December 12 | 63⅞ | 29½ |
| December 13 | 64 | $29\frac{9}{16}$ |
| December 14 | 63⅞ | 29½ |
| December 16 | 63⅜ | 29¼ |
| December 17 | 63½ | $29\frac{5}{16}$ |
| December 18 | 63¼ | $29\frac{3}{16}$ |
| December 19 | 63¼ | $29\frac{3}{16}$ |
| December 20 | 63 | 29⅛ |
| December 21 | 62¾ | 29 |
| December 23 | 62¼ | 28¾ |
| December 24 | 62⅛ | $28\frac{15}{16}$ |

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John Lawson,
General Superintendent.

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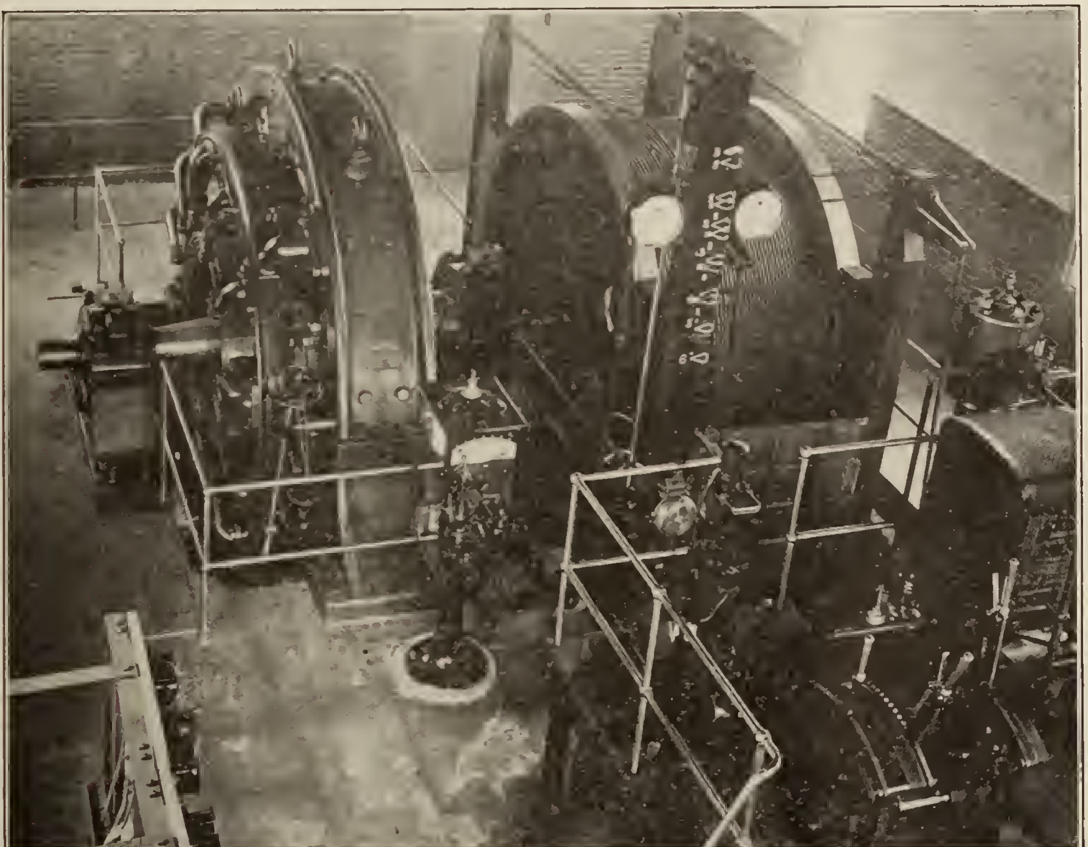

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**Engineering Instruments—**
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W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
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Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
C. O. Bartlett & Snow Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.

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Jeffrey Mrg. Co.
Mussens, Limited.
C. O. Bartlett & Snow Co.

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Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Feeders—Ore—**
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Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.
C. O. Bartlett & Snow Co.

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John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
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John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.
C. O. Bartlett & Snow Co.

**Generators—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

**Girders—Steel—**
Dominion Bridge Co.

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.

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Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

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E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
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**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

**Injectors—**
Mussens, Limited.
Peacock Bros.

**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.

**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.

**Lamps—Arc—**
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.

**Lights—Mine Bldg—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Link Belt—**
Watrous Engine Works.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.
C. O. Bartlett & Snow Co.

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Can. Bag Co.
Can. Fairbanks-Morse Co.

**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

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Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

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Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.

**Pick Machines—**
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Hardy Patent Pick.

**Picks—Steel—**
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Hardy Patent Pick.
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Peacock Bros.

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Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

**Pipe Fittings—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

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Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
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E. Leonard & Sons.

**Prospecting Mills and Machinery—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
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Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Electric—**
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Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

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Mussens, Limited.
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Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
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**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

**Pumps—Turbine—**
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E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Vacuum—**
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Smart-Turner Machine Co.

**Quarrying Machinery—**
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Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

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Fraser & Chalmers, Ltd.

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Dominion Bridge Co.
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Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
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Peacock Bros.
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B. Greening Wire Co.
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Peacock Bros.
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Chalmers & Williams.
Fraser & Chalmers, Ltd.
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Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
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American Grondal Co.
Wetherill Magnetic Separating Co.

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James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

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Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

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Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
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Fraser & Chalmers, Ltd.

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Can. Fairbanks-Morse Co.
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Peacock Bros.
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Chalmers & Williams.
Fraser & Chalmers, Ltd.

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Canadian Westinghouse.
Peacock Bros.
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Canada Foundry.
Jenckes Machine Co.
Siemens Brothers. Dynamo Works, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Robb Engineering Co., Ltd.

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Jenckes Machine Co.

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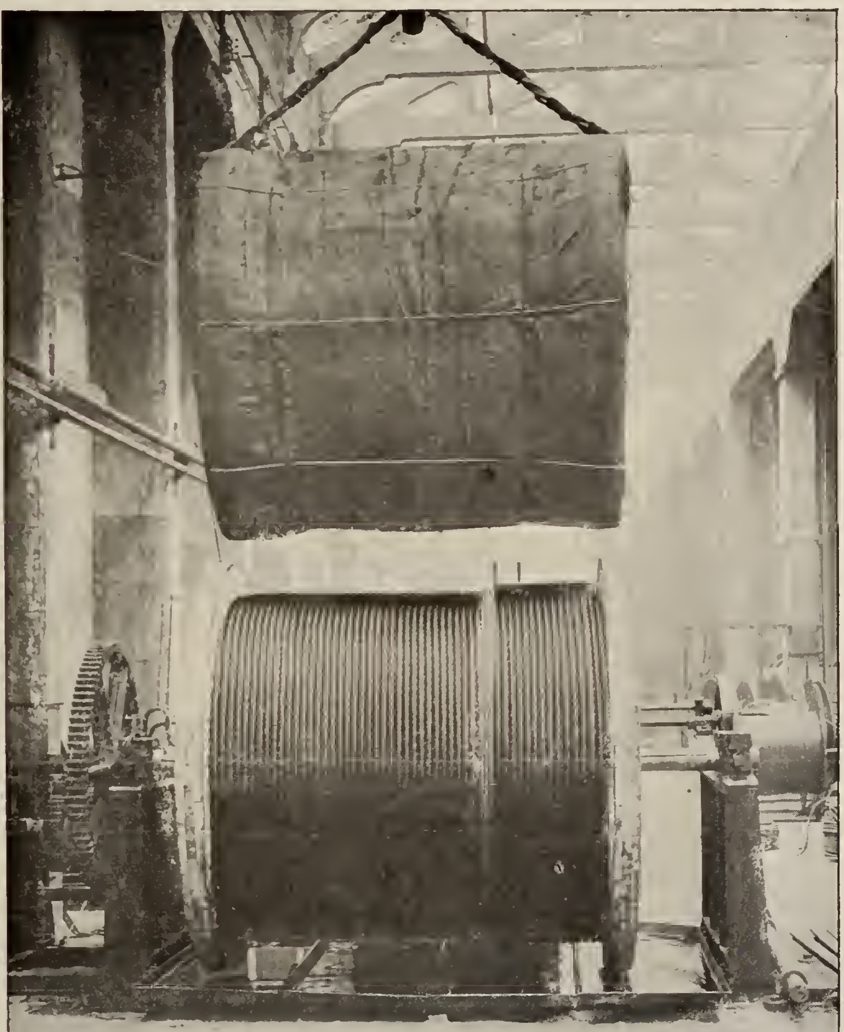

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# THE CANADIAN MINING JOURNAL

VOL. 34 TORONTO No. 2



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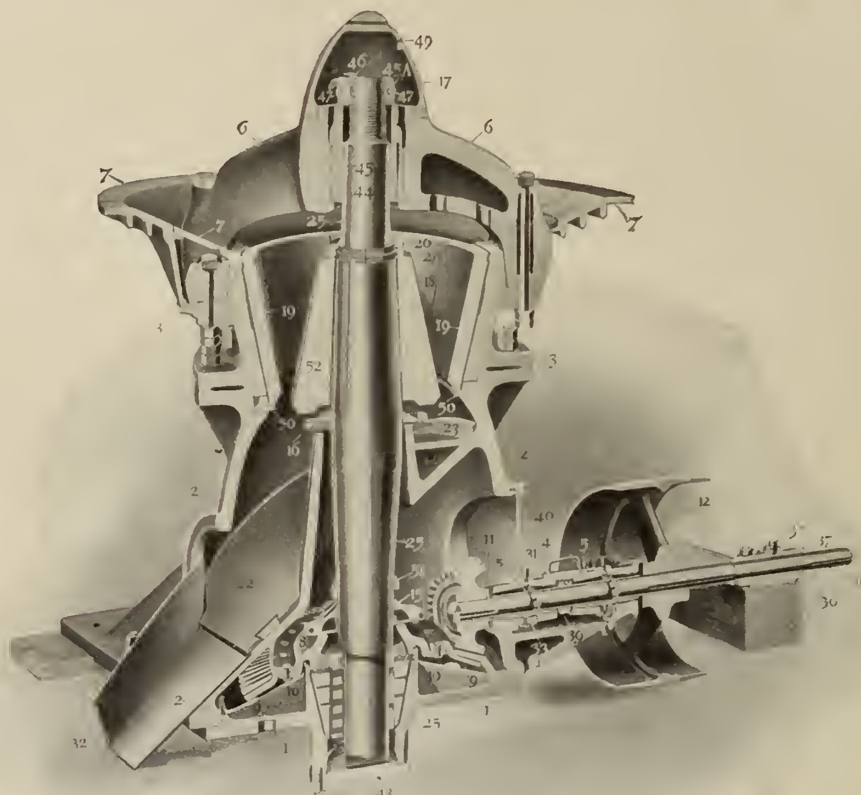

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REQUIRES LEAST POWER TO OPERATE :— This machine will break more rock per horse power than any other ever made.

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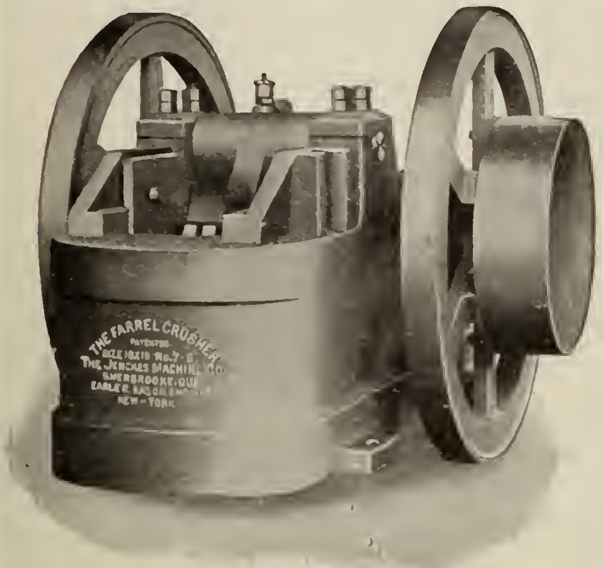

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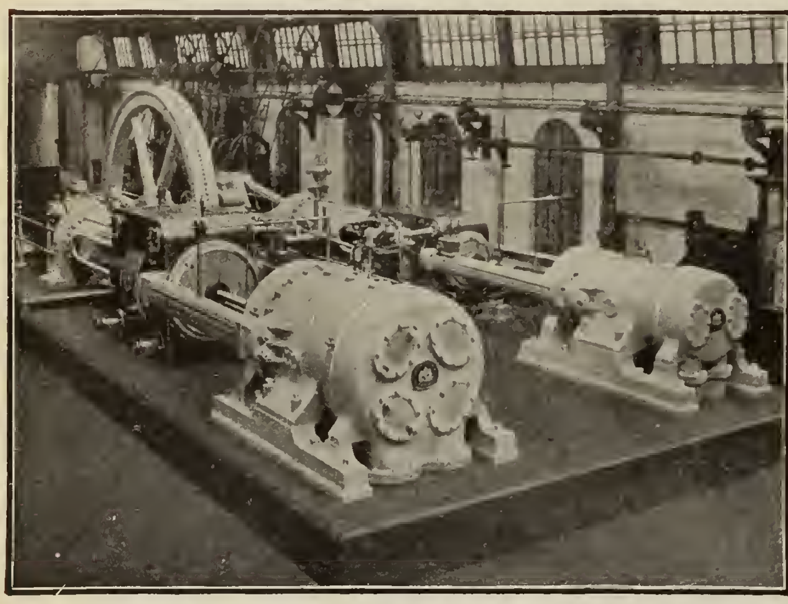

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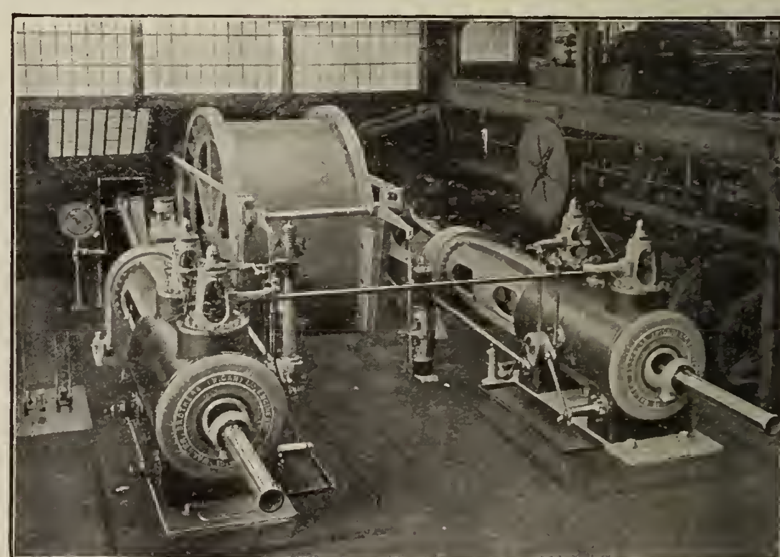

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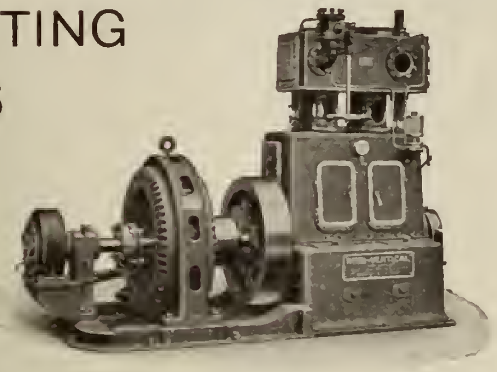

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39-5

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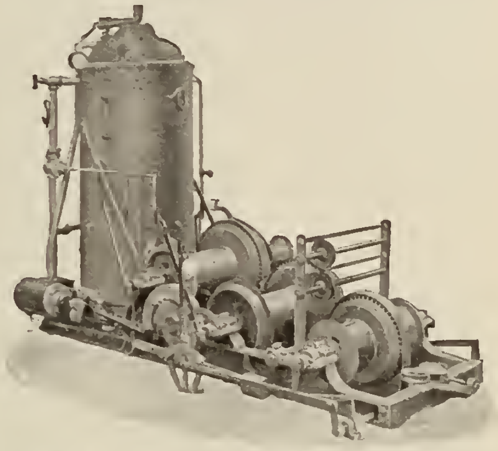

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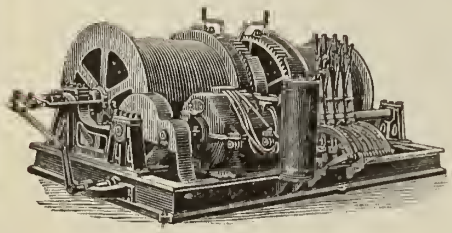

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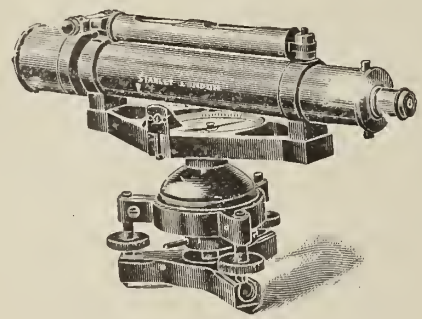

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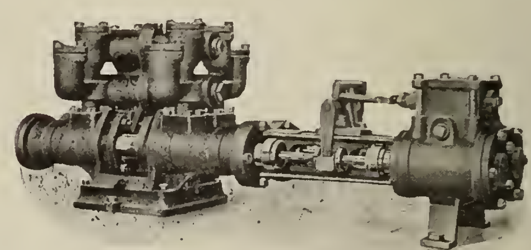

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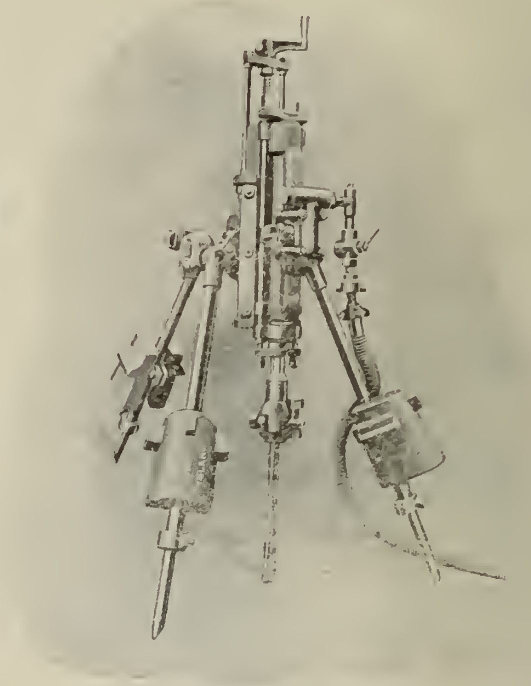

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# THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, January 15, 1913. No. 2

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CONTENTS.



## THE ONTARIO REPORT

The twenty-first Annual Report of the Ontario Bureau of Mines, 1911, dated 1912, has just been received. The most final compliment that can be paid to this publication is that it is better than those that have been published before.

The Statistical Review by Mr. Thos. W. Gibson, Deputy Minister of Mines, covers the main facts of mineral production in the Province. It is noteworthy that at present 70 per cent. of all the mineral output falls under the category metalliferous. The total value of the mineral output is placed at $41,976,797. This implies an increase of 87 per cent. during six years. But while both classes of products were almost on a parity five years ago, now the metalliferous products outvalue the non-metalliferous by much more than two to one.

Here we may quote Mr. Gibson's own words: "While "the past year was not one of sensational discoveries "or the opening up of new and important mineral "fields, it was one of steady progress and active pro- "duction. The silver mines of Cobalt touched high- "water mark, the nickel-copper deposits of Sudbury "were but little behind their output of 1910 (the largest "yet), the natural gas fields yielded nearly 50 per cent. "more than last year, the blast furnaces turned out "more pig iron, the brick and tile yards more brick "and tile, the quarries more stone, and the long list of "lesser industries, concerned in the production of other "materials were, in general, more busily engaged. At "least one promising mineral area has been revealed "by the untiring prospector—that at West Shining "Tree Lake . . . For the first time in the Province "[also] mercury was recognized . . . Tungsten "[also] was discovered in the form of scheelite by Mr. "A. G. Burrows."

Ontario has a tremendous lead on all the other Provinces. In 1911 its mineral production was valued at $41,976,797. For 1912, the figure, according to the best authorities, will be about $45,000,000; which is practically 40 per cent. of the whole Dominion's output. It is in accord with the direction of modern progress that Ontario is adding to the staff of its Bureau of Mines. That Bureau has already distinguished servants. Its aim appears to be in the right and proper direction. The only possibly fair criticism is that it needs more mining officials.

The Annual Report includes several reports of utmost interest. Two have appeared in these columns. The list covers pretty well the whole of Ontario. Swastika is written up. The Lake of the Woods, Manitou and Dryden, Cripple Creek, and West Shining Tree are not neglected. The geology of Detroit river area is described. The water powers of the region northeast of Cobalt are dealt with. Mining accidents are thoroughly tabulated and classified by the Inspector, Mr. E. T. Corkill. Statistics are given in revised form by Mr. Gibson. And the whole report appears in commendable externals.

The only change that the appreciative critic can fairly suggest is that the report is half a year late. This may be, probably is, due to the printer. The printing shop is the sump of all blame, and the origin of all delays. Yet we believe that it would be worth an effort to bring this and all similar documents out on time.

## THE WABANA MINES DURING 1912

A prosperous year has been 1912 for he Nova Scotia Steel & Coal Company. The output of iron ore from the company's Wabana, (Bell Island), was 564,000 long tons. Much attention was devoted to the submarine mines, although the land areas were consistently worked. The submarine developments included the construction of storage pockets and of transportation facilities, also the installation of several centrifugal pumps, an electric shovel, and electric hoists. The tonnage was thus so increased the daily output was brought up to 1,100 tons. A new concrete and steel machine shop was erected and equipped, also a dry-house with hot and cold running water, to accommodate 500 men. So successful was the dry-house that a considerable extension was deemed necessary.

The new shipping plant at the pier side of the yard comprises tipple, storage pocket with elevating machinery, conveyor pier, and all modern accessories. The total storage capacity is now 70,000 tons. Thus two conveyors are operated simultaneously, giving a combined loading capacity of more han 5,000 tons per hour.

The Nova Scotia Steel & Coal Company is the highest type of progressive, modern, and efficient Canadian enterprise. It is a credit to Nova Scotia and to the Dominion at large.

## THE HAWTHORNE CASE

Whatever the merits or demerits of the Hawthorne outfit, several facts emerge from the legal proceedings that have already been conducted. It is, for instance, a pitiful sight to view the son of Nathaniel Hawthorne under criminal indictment. It is also pitiful to have read the absurdly inflated correspondence that was issued in the name of the several corporations. It is not for us to assign motives, nor is it for us to allocate blame. It is, however, quite obvious that the expert witnesses called by the prosecution told the truth as they knew it. Therefore it is distressing in the extreme to note that no effort has been made to meet the facts adduced by these witnesses. Every effort was made by the defence to discredit reputable men; not one argument was advanced to controvert the statements of the witnesses.

This, of course, is in accordance with the anomalous legal procedure of United States and Canadian courts. It appears to be quite impossible to try any offender on his own merits. The consoling fact is that the trial judge, in this case, is quite beyond reproach.

Let the outcome of the Hawthorne case be what it may, there will remain little inducement for any inspired promoter to attempt similar flotations in the future.

## EDITORIAL NOTES

The rumour of an enormous merger of all Canadian steel companies with certain United States concerns has been emphatically denied by a representative of the Dominion Steel Corporation.

The United Sates Mint sold during 1812, $38,000,000 of gold bars in he United Sates and Canada. In the two countries the consumption of new gold represented about $35,000,000; about one-third of the world's total.

The output of gold in the United States during 1911 was smaller than it has been for five years. The value was $91,700,000, less by $5,200,000 than the value of 1911's output. Silver, however, crept up to about $38,-000,000, which is the highest figure attained in twenty years.

The proposed erection of a large iron, steel, and steel products plant at Sandwich, Ont., by the United States Steel Corporation is most significant. The Corporation owns 1,500 acres of land on the Canadian side of the Detroit river. This includes about one mile and a half of water frontage.

According to the last Dominion census, the value of capital represented by Canadian industries increased 276.19 per cent. during the period 1890-1910. Salaries and wages of employees showed an increase of 204.17 per cent. during the same period, while the total value of products went up 216.24 per cent.

A practical knowledge of mining is a decided advantage in farming. Dynamite is used extensively by American farmers. Low percentage dynamites are customarily employed. While there are many opportunities for utilizing explosives on the farm, the most important are such as blowing tree-planting holes, tree stump blasting, and ditching. For fruit tree planting, the dynamited hole is incomparably superior to the dug hole, as, in the former, the sub-soil is thoroughly broken up, thus giving ample space for the roots to establish themselves.

# FIELD WORK CARRIED ON BY THE GEOLOGICAL SURVEY DURING 1912

(Written for the Canadian Mining Journal.)

During the summer of 1912, the Geological Survey placed in the field over 40 independent and semi-independent geological parties. Special lines of investigation such as those in connection with the coal resources of Canada and the clay and shale deposits, envolved field work over the whole country. The detailed study of the economic possibilities and the general geological structure of various special areas was continued as in previous years. A number of parties were engaged both in the east and west in exploratory work. A considerable portion of the field work of several officers was devoted to making preparation for the various excursions to be held in connection with the International Geological Congress which meets in Canada in 1913 for the first time and which, it is hoped, will prove of great importance to the country as a whole.

Besides the geological parties, five topographical parties were placed in the field in an endeavour to provide accurate topographical maps so necessary for the proper study of the geology of various districts. The value of such maps for many other purposes has long been appreciated.

As a part of its functions, the Geological Survey also carried on special investigation in connection with natural history and the various branches of anthropology.

During the summer of 1912 the field work was completed in connection with the making of a trans-Cordilleran geological section along the main line of the Canadian Pacific Railway. This important piece of work was commenced in 1911 and has been carried out under the general supervision of Mr. R. A. Daly. It is the third nearly or quite complete section of the Cordillera so far made. The first, along the 40th parallel of latitude, from the Great Plains in Colorado to the summit of the Sierra Nevada in California, was run about forty years ago by a United States Government party under Clarence King. The second, along the 49th parallel, from the Great Plains to the Pacific, was made under the direction of the Canadian Commissioner of the International Boundary Commission (1901-7); by his courtesy, the report will soon be issued in reprint form as Memoir No. 38 of the Geological Survey.

In order to hasten the completion of the study of the section along the line of the Canadian Pacific Railway, a number of field parties were engaged during 1912, on this work. Mr. J. A. Allan, in continuation of his work of the previous year, completed the section from Banff to Golden. Mr. R. A. Daly studied the geology along the railway route in the Selkirk Mountains and the Purcell mountain system. This was in continuation of the work already performed in 1911, and amongst other results obtained, the structure of the Purcells, hitherto unknown in the part north of Windermere, was worked out. Mr. C. W. Drysdale was engaged in the study of that portion of the section between Six Mile Point on Kamloops Lake and Lytton, while Mr. B. Rose made a special examination of an area about the west end of Kamloops Lake. Mr. Charles Camsell and Mr. N. L. Bowen studied the section along the railway line from Lytton to Vancouver.

The study of another geological section of prime importance, namely that along the Yukon-Alaska international boundary from the crossing of Yukon River northward to the Arctic, was also complete in 1912. This work was performed in co-operation with the United States Geological Survey which undertook to map the geology between Porcupine River and the Arctic Ocean, while the remaining portion from Porcupine River southward to Yukon River was undertaken by the Canadian Geological Survey. Mr. D. D. Cairns completed in 1912 the geological mapping of this southern part.

Mr. R. G. McConnell made a special examination of the geological section through the Coast Range from Prince Rupert to Aldermere. He also spent a short time examining some of the gold-bearing quartz deposits that are being developed on Princess Royal Island and spent a longer period of time on Texada Island in connection with the recent mining developments there taking place.

Mr. C. H. Clapp engaged in field work on Vancouver Island, geologically surveying the area represented by the Sooke and Duncan map sheets. Certain bodies of gabbro in this general district carry copper sulphide deposits of prospective importance. The recent study of the field has lead to the important discovery that there are a greater number of these gabbro bodies than hitherto supposed. Mr. Clapp also spent some time on Graham Island gathering information concerning the recent developments of the coal measures of the island. It was found that the coal, while of excellent quality, occurs in much smaller basins that was previously thought.

Mr. G. S. Malloch continued his examination of the Groundhog coal basin. The dimensions of the field are, roughly, 30 miles by 45 miles, but the coal-bearing horizon has been removed by erosion from a considerable portion of this area. Mr. Charles Camsell, besides engaging in the study of the section of the Cordilleras along the main line of the Canadian Pacific Railway, also studied a general section from Midway to Spences Bridge. An examination was made of the gold-copper deposits of Kruger Mountain at the southern end of Okanagan Valley, and of the gold-copper deposits on Independence Mountain in the range between Keremeos and Twenty Mile Creeks, Similkameen district. Mr. Camsell made a brief study of the copper deposits at Copper Mountain, Similkameen district, where the British Columbia Copper Company has been for the last year carrying out important development work. The result of this work has been to prove the existence of large deposits of low grade copper ore, which, if they can be successfully treated, will mean that a new and important copper producing field will soon be opened up. A brief study was also made of the Tertiary coal-bearing rocks of White Lake in Okanagan Valley.

Mr. A. M. Bateman made a preliminary examination of the economic resources of the Bridge River district. In this district, mining work is being carried on in the Cadwallader Creek section, where the gold-bearing veins, though small, are persistent and their gold content is sufficiently high to justify mining of the ore on a commercial basis. Mr Bateman also made an exploratory trip from Lillooet to Chilko Lake. As a result of this trip, the eastern border of the Coast Range batholith, which is in many places an important mineral zone, was outlined and the bordering strata were found to be of lower Cretaceous age instead of Palaeozoic, as previously supposed.

Mr. H. Ries, while continuing his study of the clay and shale deposits of British Columbia, made examinations along the Columbia River Valley from Golden southward and from Revelstoke northward. In both districts, deposits of clay or shale, which can be utilized for common and pressed brick and perhaps for other classes of products, were found. A study was also made of the shales of the Nanaimo series on the east coast of Vancouver Island.

Mr. S. J. Schofield made an examination of the part of East Kootenay lying south of the Crown's Nest branch of the C.P.R. and between Kootenay River and Kootenay Lake. The mineral-boarding belt, containing the St. Eugene, Aurora and Society Girl ore deposits, was outlined southwards to the international boundary.

Mr. D B Dowling visited a number of the principal coal areas both in Eastern and Western Canada in order to obtain the necessary information to enable him to make a review of the coal fields of Canada

Mr. W. W. Leach made a detailed examination of an area about Blairmore, which includes practically all the producing mines of the bituminous coal fields on the Alberta side of Crow's Nest Pass.

Mr. J. D. Mackenzie made an examination of the district lying immediately south of the Blairmore map-area. This area includes most of the foothills between the valleys of south fork of Oldman River and Pincher Creek. In it lies the southward extension of the coal areas of the Blairmore district.

Mr E. S. Moore carried on an exploration in the Pre-Cambrian region lying east of the southern part of Lake Winnipeg, partly in Manitoba and partly in Ontario

Mr. C. R. Stauffer completed his studies in connection with the Devonian strata of the peninsula of Southwestern Ontario. This work is of importance in connection with the general problems of the extensive oil and natural gas districts of Ontario. This field of endeavour was further supplemented by the work of Mr. M. Y. Williams, who devoted some time to the study of the Hamilton formation (Devonian) of Lambton County. He was, however, mainly engaged in stratigraphical and palaeontological studies on the Silurian sections of Manitoulin Island.

Mr. W. A. Johnston continued topographical and geological field work in the neighbourhood of Lake Simcoe. An area of about 1,200 square miles surrounding Lake Simcoe has now been accurately mapped on a scale of one mile to one inch with 20-foot contours.

Mr. W H. Collins continued and almost completed a detailed geological reconnaissance of the Onaping map-area lying to the north of the Sudbury district.

Mr. M. E. Wilson made a geological reconnaissance in northwestern Quebec of a belt of country extending from Lake Kipawa via Grand Lake Victoria to the headwaters of Nottaway River.

Mr. H. C Cooke explored the headwaters of Broadback River between Lake Evans and Lake Mistassini, in northern Quebec

Mr. R. Harvie examined a geological section across Brome County Quebec, from Lake Memphremagog westward to Sweetsburg in order to obtain more knowledge concerning the general relations of the older formations. It was hoped, among other results, to ascertain what connection, if any, existed between the copper deposits of Missisquoi Valley and those of the belt found in Sutton, Brome, Stukely and Ely Townships to the west. The subject is of present importance, owing to a renewal of interest in copper mining throughout the general district.

Mr. J. Keele made an examination of various clay and shale deposits in the Province of Quebec and in part of New Brunswick. The principal part of the season was spent in the region adjacent to the St. Lawrence River between Montreal and the City of Quebec, a field containing one of the largest markets for clay wares in Canada.

Mr. W. A. Bell completed his work on the Joggins section of Nova Scotia. This is one of the standard Carboniferous sections of the Maritime Provinces and the elucidation of the various problems there presented are of direct economic value in connection with the development of various coal areas in the region.

Mr. E. R. Faribault continued the geological mapping of the gold-bearing series of the southern portion of Queens and Lunenburg Counties, Nova Scotia.

Besides the various field parties listed above, engaged in field work of direct economic importance, others took up various problems whose scientific importance and indirect economic value can hardly be over-estimated. In Nova Scotia, Mr. J. E. Hyde engaged in palaeontological work on the Carboniferous strata, paying particular attention to the Sydney field. Mr. W. J. Wright studied various problems in connection with the eruptive rocks of the gold field of southwestern Nova Scotia in an attempt to add to the sum of knowledge relating to the origin of the gold-bearing and tungsten-bearing ores.

In Western Canada, Mr. E. M. Kindle engaged in the study of the Palaeozoic section of northern Manitoba. Mr A. McLean carried on palaeontological work in southern Manitoba. Mr. C. H. Sternberg made collections of vertebrate fossils from the Edmonton formation in the vicinity of Munson, Alberta. Mr. C. D. Walcott engaged in work on the Cambrian system of the Yellowhead Pass.

The field work performed during 1912 by the Topographical Division of the Geological Survey, was as follows:

Mr. K. S. Chipman commenced topographical work in the Windermere district. The map, when completed, will include the Columbia Valley from Dutch Creek to Number Two Creek and the country to the west for a distance of about 25 miles.

Mr. W. E. Lawson engaged in work in Lillooet district The topographical map will include a greater part of Bridge River district and the headwaters of Eldorado Creek.

Mr. D. A. Nichols prepared a detailed topographical map of the iron ranges on Texada Island, and also a map of a portion of the northern end of the island.

Mr. B. R. Mackay completed the mapping of the Blairmore area. This map includes all the towns between Coleman and Burmis on the Crow's Nest branch of the C.P.R. and covers the areas in which the principal coal mines are operating.

In New Brunswick, Mr. A. C. T. Sheppard completed a sheet in the neighbourhood of St. John City. This map includes the City of St. John and the Towns of Rothesay and Lorneville. The map will be published on a scale of about 1 mile to 1 inch, with 20-foot contour intervals.

The various topographical maps, when completed, will indicate all cultural features such as roads, railways and buildings, in black; all lakes, streams, etc.. in blue; while relief will be shown by contour lines in brown. The maps can be used for a variety of purposes and should prove very useful.

# REVIEW OF OPERATIONS AT THE DOME MINE, SOUTH PORCUPINE

Written specially for the Canadian Mining Journal.

During the past year, wonderful progress has been made throughout the whole of the Porcupine camp, and at no place has this been more noticeable than at the Dome mine. Following the fire of July, 1911, considerable time was lost in getting in materials, so that a large portion of the heavy construction work had to be performed in the dead of winter, with the temperature often many degrees below zero.

At the beginning of the year, following the appointment of Mr. W. W. Mein as consulting engineer, several radical changes were made in the crushing stations, and also in the mine development plans, so that the real work of the company may be considered to have started at that time.

### Mine.

The ore body consists of a large mineralized zone, in which occur lenses of ore, but the values are so distributed that the whole deposit may be worked with very little sorting. So far, all the work has been done by open-cut methods, and what sorting is necessary is accomplished by cleaning out the stope and then shooting down the waste rock which is trammed out separately.

During the first part of the year, development work was largely confined to the 45-foot level. This was necessary on account of the lack of power and for the purpose of bringing the mine to the producing stage as rapidly as possible.

Raises were put up at intervals, and at the bottom of the raises, chutes or boxes were built. These chutes were built sufficiently strong to permit of blasting large pieces which sometimes get into them. All the mining is open-cut work, the ore being broken into the raises, which are kept full so that large blocks may be sand-blasted at the surface. The actual breaking of the ore is done by hammer drills and a duty of about 50 tons per man per day of 9 hours is attained.

The broken ore is drawn from the bottom of the raises into 16 cubic feet V-shaped side dumping cars, and the tramming is done by mules.

As soon as possible, the development work on the 100-foot level was completed and raises put up to connect with those on the 45-foot level. On account of the greater lift, fewer raises are necessary.

An interesting feature of this property is the incline from the crusher station to the 100-foot level. This did away with the necessity of hoisting the ore through a vertical shaft and tramming it to the crushers, and while serving to develop the west end of the property, is remarkable for its simplicity and the ease and economy with which the tonnage is handled.

The breaking of ore, tramming, hoisting and crushing is all done on the day shift.

### Crusher Station.

The ore is hauled up the incline in trips of four to six cars, and is dumped direct into a No. 7½ gyratory crusher. The broken rock falls on a conveyor belt and is elevated to a pair of No. 3 gyratory crushers, first passing over a grizzley which takes out any material which will pass through an inch ring. This undersize and broken rock from the No. 3 crushers which will pass through a two-inch ring, falls on a second belt conveyor which carries it to the mill bins. The advantage of this method is that both sets of crushers are on the ground so that the construction work is very simple and the crushers are always on a solid foundation.

### Mill.

The mill was designed and erected by the Merrill Metallurgical Company and has fully borne out the promises made for it. It is a steel and concrete structure, covered with two layers of corrugated iron between which was placed a layer of hair felt to provide an insulating material and permit of economically heating the building.

The ore from the 1,600 ton bins is crushed through 12-mesh by 40 stamps of 1,250 pounds each, the pulp passing over the primary amalgamating plates to four Dorr classifiers. These primary plates are to be discarded as the scouring action of the coarse pulp prevents efficient amalgamation. From the classifiers, the slimes pass over a second set of amalgamating plates and then direct to the Dorr thickeners, the coarse sand going back to the tube mills. The product from the tube mills is pumped back to the classifiers, this process being continuous. From the Dorr thickeners, the pulp is elevated to four Pachuca air agitation tanks 40 feet high by 8 feet in diameter, the cyanide being added at the elevator boot. From these tanks, the pulp passes two Dorr thickeners and then to a mechanical agitator which is used solely to prevent the solids settling before they are sent to the presses. These presses are Merrill pressure filters, and have been found to be most satisfactory for this class of ore. The presses discharge into Dorr thickeners, where some of the water is saved and is used again as wash water.

The precipitation takes place in Merrill zinc dust presses, the resulting product being treated first in a small blast furnace with litharge. The lead bullion is then cupelled, the product being remelted in an oil-heated tilting furnace.

The mill is efficient, and ore extraction of 97 per cent. is attained. Of the total gold recovered, about 60 per cent. is obtained from the amalgamating plates.

The treatment of this ore does not present any metallurgical difficulties, the only troubles being of a mechanical nature. The stamps have a duty of 10 tons per day, but the tube mill and press capacity is only 350 tons per day. A new tube mill and filter press are being installed and, when these are in operation, the mill should treat 400 tons daily.

### Company Organization.

The organization is divided into different departments, each department having its separate head. The lines of distinction are clearly drawn, there is no overlapping of authority, and each head is directly responsible for the work of his own department.

The sub-divisions are as follows:

Mill Superintendent, who has charge of the mill and assay office.

Mine Superintendent, who has charge of the mine.

Mechanical Engineer, who has charge of all surface labor, power house, machine shope, boiler shop, blacksmith shops, all repair work, construction work, electricians and mechanical draughtsmen.

Mine Engineer, who has charge of surveying, sampling and diamond drilling and geological work, and who is responsible for the proper compilation of data regarding ore reserves, etc.

Chief Clerk, who has charge of the accounting and time-keeping departments and of stores.

Steward, who has charge of the bunk houses, mess houses, clubs and company store.

All these departments are directly responsible to the general superintendent, and in this way the maximum of efficiency is obtained.

The Canadian Mining & Exploration Company, at the head of which is Mr. W. W. Mein, has been appointed consulting engineers.

The property is well equipped with machine and repair shops, and has a plant of sufficient capacity to generate power for all purposes. Hydro-electric power from Waweatin Falls will, however, be available in a short time, and when this is in use, costs will be materially reduced. Brick buildings for the accommodation of the men and the staff have been constructed, and a very complete hospital is also available.

# PROGRESS ON THE METALLURGY OF COPPER DURING 1911.

Written for the Canadian Mining Journal by George A. Guess.*

Copper metallurgy during the year 1912 has been stimulated by a steadily increasing price for copper. The price of the metal had remained low since the slump in 1907 until December, 1911, when it began to recover and during the present year it has steadily increased from fourteen cents in January to seventeen cents in June, remaining slightly above that figure for the balance of the year. This increased price of copper enhances the value of the output for 1912 over the year 1911 upwards of $50,000,000.

The present year has seen a growth of reverberatory furnace rather than blast furnace smelting. The increasing tonnages of concentrates, particularly in the southwest, have demanded the construction of more reverberatory furnaces. The time has gone by for the smelting of this fine material in blast furnaces. The new reverberatory plant of the Ray Consolidated at Hayden, Arizona, was in commission in May, and will handle the product from their large concentrators. The smelter at Humboldt, which consists largely of reverberatories, resumed operations in February. The Copper Queen put two oil-fired reverberatories in operation during the year, after spending some time investigating other methods of handling fines. The new plant of the Calumet and Arizona at Douglas will have four large reverberatories. The fact is realized that fine ore is a detriment to blast furnace operations, taking more coke, running more slowly, and producing quantities of flue dust. The practice, therefore, of screening blast furnace ores is becoming general. These fines, together with the flue dust, are smelted in reverberatories where their quantity is sufficient to justify such a furnace or sintered for blast furnace treatment when the tonnage is small. The Canadian Copper Co. at Copper Cliff has during the year added two large reverberatories to their smelting plant. These handle fines and flue dust and converter slag. On account of the basicity of the charge these large reverberatories have a hearth and side walls of basic brick. These are the first reverberatories to be designed and built for the burning of pulverized coal. Previous experiments in firing reverberatories with pulverized coal have been adaptations to existing construction.

Reverberatory furnaces show little change in construction. The limit of size appears to have been reached. The front of the furnace is now, however, usually built straight into the flue. The skimming is done at the side near the front.

For roasting sulphide fines for reverberatory smelting the Macdougall type of roaster continues in favour. Larger sizes, however, are being used and the rabble arms have been speeded up to twice their former speed resulting in greatly increased capacity. Roasting furnaces that have been developed in the sulphuric acid industry have entered the field of copper smelting. Herreshoff furnaces are being installed at the C. & A. at Douglas. Wedge furnaces have been put in at Braden, Copper Cliff and other places. Bedding of the charge that has proved advantageous to blast furnace operations is being adopted for fines for reverberatory smelting, and should result in greater uniformity of work and capacity, in their operation. The handling of the Miami concentrates (which consist of silica, copper, and sulphur, with practically no iron) continues to be a unique as well as successful operation. These concentrates are treated at Cananea and are blown into the converters. The construction of a suitable dust chamber for the converter gases has been found necessary.

The Canadian Consolidated Co. at Trail has changed the practice of granulating and roasting the low grade copper matte, high in gold values, and is smelting it direct with silicious ores in the blast furoace. A wide blast furnace has been developed at Great Falls. This is 84 inches wide at the tuyeres and in cross section looks like an early form of iron blast furnace. The upper tier of jackets conveying at the top. By using a slotted tuyere 3 in. x 11 in. with the long axis vertical 120 square inches of tuyere area are obtained per foot of furnace length. This is about three times the tuyere area of an ordinary blast furnace. Blast furnaces 72 inches wide at the tuyeres give improved running at Cerro de Pasco. The new blast furnace plant of the Mason Valley mines was blown in early in January.

Very considerable strides have been made in the development of basic converting during the year. The use of a basic lined converter is now almost universal. The long barrel form of the Peirce-Smith up to 37 feet in length as at Copper Cliff, has been the general form installed until this year when the form developed at Great Falls has found tremendous favour and has been installed generally in the southwest at Cananea, at the Copper Queen, and at the C. & A. at Douglas. This

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form is a development of the Parrot type of converter, and has been formed to give astonishingly long life to a lining over 12,000 tons of copper have been made from one lining. The charges on this form are smaller and are finished on each shift. The Peirce-Smith takes a big charge, and twenty-four hours or longer to finish. The size of the tuyeres has been increased and their number doubled, fifteen one-inch tuyeres being increased to 34, 1 3-inch tuyeres for a 12-foot diameter converter. In addition to the two large types, many plants have lined their old acid shells with magnesite brick and are using these very successfully.

The neutralization of smelter smoke has made little progress throughout the year. The Balaklala smelter in which the Cottrell process was installed, remains closed. The Mammoth smelter at Kennet, where the Sprague process (neutralization of sulphuric anhydride with zinc oxide and baghousing the gases) has been installed, is in operation; but a new association of Shasta county farmers was formed in December to renew the fight against the smelting company. The Thiogen process of Prof. Young is still in the experimental stage. Experiments have been conducted at the Penn Smelter at Campo Seco, Cal. This process reduces the oxides of sulphur to metallic sulphur by means of volatile hydrocarbons. The two smelters in Tennessee continue to produce sulphuric acid. The output of the Tennessee Copper Co. exceeds 500 tons of 60 deg. Beaume acid per day. Despite this production of acid the company was not free from claims for smoke damage. It would appear, therefore, to be an almost impossible matter to protect vegetation from damage by smelter smoke even when the location of the plant makes it possible to manufacture from it sulphuric acid and find a market for the acid. Unfortunately, Canada has a very limited market for sulphuric acid. The average daily production of acid in Canada does not exceed 75 tons; whereas the production in the United States is upwards of 10,000 tons per day. Fortunately in Canada we hear very little complaint against the smelters on account of smoke. The smoke is recognized as a necessary evil. The short-sighted policy pursued in California has resulted in the permanent closing of some plants that afforded the only market the farmers had. They then tried to undo the damage they had done by urging the resumption of smelting operations.

The last few years has seen wonderful tonnages of low grade copper ores handled in wet concentration plants, particularly in Utah and Arizona. The extraction is, however, extremely low, being more often under 70 per cent. than over. This tremendous waste has turned attention to wet methods of treating low grade copper ores. Although there has not been any great progress made during the year, there are at the present time a great many companies investigating various processes. In fact, all the larger copper companies in the United States are experimenting for the wet treatment of their low grade ores. The Anaconda Company has been investigating the Bradley process. The Copper Queen has two men who have spent much time in copper leaching experiments investigating their possibilities. The Braden Copper Co. is experimenting in the leaching with sulphuric acid made from the roasting of their concentrates.

It is quite likely that the next two years will see some new developments in the hydrometallurgy of copper. Nothing new has been given out during the year regarding the progress made by the Bradley process in treating the Anaconda slime accummulation. Such has been found extremely difficult to do anything with, and if Mr. Bradley can work out the successful treatment of slime he will find many applications for his process.

# THE COAL TRADE OF NOVA SCOTIA IN 1912.

A Resume by F. W. Gray.

The year 1912 presented no outstanding features of interest concerning the coal mines of Nova Scotia, with the notable exceptions of the increase in production and a large capital expenditure on new mines and equipment.

As far as can be estimated at the time of writing, the coal output of the Province will approximate 6,900,000 tons, an increase over 1911 of 650,000 tons.

Cape Breton mined 5,650,000 tons, or 82 per cent. of the entire tonnage. The combined output of the collieries controlled by the two large Cape Breton companies, the Dominion Coal Company and the Nova Scotia Steel & Coal Company, accounts for 5,770,000 tons, or 84 per cent. of the provincial output. The Dominion Coal Company's collieries in Cape Breton and on the mainland put out a total of 4,934,000 tons, or 72 per cent. of the entire Nova Scotian output.

The whole, and more, of the total increase in outputs over 1911 has come from the properties operated by the Dominion Coal Company, who exceeded the 1911 production by 683,000 tons, comparing with the total provincial increase of 650,000 tons.

Considering the large capital expenditure that has been made on coal mines in Nova Scotia, the increase in production is not any greater than it should be, and if a comparison is made with the United States the insignificant character of the increase becomes plain. On the authority of the "Coal Trade Journal" the coal production of the United States in 1912 was 540,000,000 tons, being 40,000,000 tons greater than the high mark of 1910. The mere increase in the United States output is, therefore, almost four times greater than the entire annual coal output of Canada.

It does not appear probable that 1913 will see any very remarkable rise in the outputs of the Province. It may be anticipated that the Dominion Coal Company will again provide the greater portion of the additional tonnage; and the Acadia Coal Company will probably reap the benefit of their large capital outlay in 1911 and 1912. The development of the new openings which it is understood are projected at the mines of the Nova Scotia Steel & Coal Company, and by the Inverness Coal & Railway Company at Inverness, will not add greatly to production until 1914.

The general prosperity of the coal trade during 1912 was helped by the coal shortage occasioned by the English coal strike and the anthracite strike in the United States. In the spring there was a brisk demand for bunker coal, and a good deal of Nova Scotian coal found its way into ports usually supplied from British mines. The steady growth of manufacturing concerns around Montreal, and the opening up of the eastern sections of the new transcontinental lines is creating a healthy demand for soft coal in the natural market of Nova Scotia.

**Walker ventilating fan and fire-proof House—Dominion No. 14 Colliery.**

There were no accidents during the year involving serious loss of life. So far as it is possible to ascertain the fatality rate will be less than that of 1911, probably about 2.5 per thousand employed.

The Commission appointed by the Nova Scotia Government to investigate the flooding of the Port Hood Colliery completed its work during the year, and it is expected that the report will be made public when the Provincial Legislature assembles in the spring. There have been no new developments in this matter during the year.

The Morien Colliery, previously operated by the North Atlantic Collieries Company, was dismantled and abandoned during the summer of 1912.

The Broughton Colliery, situated near the fringe of the Morien Basin of the Sydney coalfield, about three miles from No. 21 colliery of the Dominion Coal Company, and owned by the Cape Breton Coal, Iron & Railway Company, has been idle since 1907. At the present time some activity is being shown, and it is understood a coal-shipping pier is to be erected on Mira Bay, and a railway branch of four miles in length is to be constructed connecting this pier with the mine.

The promoters and officers of the Cape Breton Coal, Iron & Railway Company are all reputable Englishmen connected with coal mining in Great Britain, and are themselves largely interested financially. The prospectus of the Company as advertised in England was decidedly roseate, and if the results therein forecasted are obtained, it will surprise disinterested local mining men, who are in a position to judge from their own experience. Under the circumstances, the writer prefers not to hazard a prediction as to whether the Broughton mine will become an important factor in coal production in 1913, or not.

Following is a tabulation of the outputs of the principal operating companies in Nova Scotia. The figures are only approximately correct, accurate tonnages not being available at the time of writing. There is much ambiguity about figures of Nova Scotian coal outputs, as some returns deal only with sales, and others follow the Government year which ends on September 30th.

| | Outputs 1911 Tons 2240 lbs. | Outputs 1912 Tons 2240 lbs. |
|---|---|---|
| Dominion Coal Company— | | |
| Glace Bay mines | 3,985,000 | 4,514,000 |
| Springhill mines | 266,000 | 420,000 |
| Nova Scotia Steel & Coal Co. | 780,000 | 842,000 |
| Acadia Coal Company | 370,000 | 433,000 |
| Intercolonial Coal Company | 263,000 | 236,000 |
| Inverness Coal Company | 291,000 | 280,000 |
| Maritime Coal Company | 160,000 | 120,000 |
| Colonial Coal Company | 30,000 | 35,000 |
| Others | 105,000 | 50,000 |
| | 6,250,000 | 6,930,000 |

The Nova Scotia Steel & Coal Company exceeded their 1911 tonnage by 62,000 tons. The output therefore comes back to the same level as in 1910. This company have not made any important additions to their colliery equipment during the year, but it is understood a new shaft is projected in the near future.

The Acadia Coal Company increased its output to 433,000 tons, although, during the concluding months of the year the operations of the company have been hindered by disagreement with the workmen as to hours of work on Saturdays.

During the year the new central power plant at the Allan shaft was completed, which is intended ultimately to provide electric drive for both the Allan shaft and the rejuvenated Albion mine. At this last named colliery a new steel bank-head has been erected and a complete electric equipment, including fan, compressors, screening plant and underground pumps. At the Allan shaft a high-duty steam-driven hoisting engine is being installed, with which it is expected to hoist four-deck cages from No. 1 shaft.

A full description of the new equipment of the Acadia Coal Company was given in the special Nova Scotia edition of this Journal, as was also a detailed account of the Nova Scotia Steel & Coal Company's coal mines, so that it is unnecessary to say more in this article.

The Acadia Coal Company has carried out extensive diamond drill prospecting during the year, having put down bores over 2,000 feet in depth. The company is also unwatering the Ford seam and energetically developing its properties in general.

The Intercolonial Coal Company show a small falling off in their output. The management hope, however, to recoup the decrease in 1913.

The output of the Inverness Coal Company shows a decrease of 12,000 tons, which was partly caused by labour troubles. A Conciliation Board was appointed by the Government to consider and adjust these complaints, which was done in a manner satisfactory to all concerned. It is the intention of the management to instal a new and more powerful hoisting engine. The coal has now to be hauled a distance of 6,000 feet from the deep and the present engine is too light for the work. It is expected to have the new engine ready for work against the opening of navigation in the spring. In the near future the management intends to sink a slope on the 13-foot seam, which overlies the 7-foot seam now being worked.

The Maritime Coal Company produced less coal than in 1911, and they have added no new equipment.

Mention may also be made of the Colonial Coal Company, whose mine is situated between North Sydney and Sydney Mines. This company, although only operating on a small scale, has introduced a commendable innovation in a briquetting plant. The coal produced by this company's mine would not stand exposure to the weather or transportation, and quickly became slacky. To get over this difficulty, the management decided to briquet the coal, and they have succeeded in producing a product which has met with considerable local demand. It will not be surprising to hear of some of the larger coal companies in Nova Scotia following the example of the Colonial Coal Company. The modern briquetting plant is a great advance over the old-fashioned machine, which produced a large "brick," to consolidate which it was necessary to use an undue quantity of pitch. The plant of the Colonial Coal Company turns out a briquette about the size of a goose egg, hard and polished, and capable of standing transportation.

The Dominion Coal Company had a particularly successful year. The output of the Glace Bay collieries was approximately 4,514,000 tons, comparing with 3,984,749 tons in 1911, an increase of 530,000 tons. Following is a comparison of the outputs by collieries:

| | 1911 (tons) | 1912 (tons) |
|---|---|---|
| No. 1 | 577,405 | 585,000 |
| 2 | 755,879 | 818,000 |
| 3 | 171,473 | 131,000 |
| 4 | 392,727 | 425,000 |
| 5 | 324,511 | 267,000 |
| 6 | 254,975 | 275,000 |
| 7 | 194,539 | 202,000 |
| 8 | 178,824 | 155,000 |
| 9 | 408,869 | 431,000 |
| 10 | 183,992 | 216,000 |
| 12 | 281,407 | 330,000 |
| 14 | 184,544 | 321,000 |
| 15 | 40,292 | 148,000 |
| 16 | 17,963 | 131,000 |
| 21 | 17,391 | 58,000 |
| 22 | ....... | 221,000 |
| | 3,984,749 | 4,514,000 |

No 1 colliery had the largest output since 1902, the year immediately preceding the fire that occurred in this mine. Nos. 2, 6, 7, 9 and 10 collieries all produced the largest tonnage in any year. The most striking increases, however, are naturally in the new mines of the Waterford district, and at Birch Grove. The combined increase of the Waterford collieries over 1911 amounts to 410,000 tons, and the Birch Grove collieries, of course, show much larger tonnages. The major portion of the Coal Company's increase over 1911—ninety per cent. to be exact—comes from the new collieries 12 to 22 inclusive. The only collieries showing a decrease are Nos. 3, 5 and 8, these three mines being old collieries approaching the stage of small production preceding exhaustion. Old mines, however, like King Charles, are often a long time a dying. A point of interest in connection with the older collieries of the Dominion Coal Company is that they are all on the upper and thicker seams first attacked, so that the plant

**Slopes and temporary Bankhead arrangements—Dominion No. 22 Colliery.**

and shafts can be utilized for the mining of the lower seams, as yet practically virgin.

The Coal Company has made very large additions to their equipment during 1912. As these were described by the writer in more or less detail in the special Nova Scotia edition of the Journal, published in September, a brief recapitulation will suffice.

At No. 2 colliery a large Walker ventilating fan, with adequate concreted surface airways was installed. This fan is to be used only as a spare or emergency fan, and is entirely additional to the ordinary ventilating machinery of the mine.

No. 14 colliery was provided with a permanent electric coal hoist, already fully described in the columns of this Journal. Since installation the hoist has worked continuously and satisfactorily.

At No. 15 colliery the permanent bank-head was completed, together with all the surface erections. The permanent coal hoist will be installed next spring, and like No. 14 hoist, will be electrically operated.

hoist and colliery buildings were all completed. The construction of the bank-head at No. 22 colliery is proceeding, and this colliery will be equipped to the full producing stage in 1913.

It is also probable that the Coal Company will reopen the Emery seam near the present No. 3 colliery. Slopes were driven here from the outcrop of the Emery seam in 1899 for a length of 1,600 feet, and were temporarily abandoned in 1901. The existing plant and bank-head at No. 3 colliery will be utilized for the reopened slopes, to which the name of Dominion No. 11 colliery will be given.

By the early summer of 1913 the Coal Company expects to have sixteen collieries in full operation, with complete equipment, and to have Nos. 11 and 17 collieries well under way.

Unless the unforeseen intervenes, the outputs and shipments of the Coal Company in 1913 should be even larger than they were in 1912. The mines will work steadily all through the winter, so far as the weather

**Mouths of Slopes, Compressor House and Bankhead—Dominion No. 21 Colliery.**

The erection of the colliery buildings is proceeding at No. 16, and brick is being used instead of wood, a commendable departure. Although this colliery is producing up to one thousand tons daily, the equipment is as yet of the most temporary character. The permanent bank-head is under construction and will be completed in the early summer of next year.

An electric power transmission line has been run to the site of the old Victoria mine, which it is the intention of the company to unwater and re-open for work as soon as possible. Electrically driven centrifugal pumps are being set up at the present time. The work of rehabilitating the underground workings will be proceeded with as the water in the mine is lowered. This colliery was closed by the Coal Company in 1897, and in that year produced over 100,000 tons. It is expected that it will be possible to obtain a considerable output from the workings quickly, as the territory will not require to be developed as in the case of an entirely new mine. The coal taken from the Old Victoria slopes had an excellent reputation for quality.

At No. 21 colliery, the premanent bank-head, coal

permits, and a larger quantity of coal will be stocked during the season of closed navigation than in any previous winter season. Although it is not considered good form to prophesy regarding coal outputs, it is not unreasonable to anticipate an output from the Coal Company's Glace Bay mines of from 4,700,000 to 4,800,000 tons during 1913.

A new electric generating station to serve the Waterford collieries has been partly completed, the first electrical unit having been installed. The Bettington boilers are under steam, and power is being generated to supplement the current generated at the No. 2 power house.

In the Waterford and Birch Grove districts the company has made large expenditures on dwelling house accommodation for its work people, and has also installed extensive water systems for supplying the collieries, for fire protection, and the domestic requirements of the colliery towns. The company is also supplying electric light and power to the large population that has been attracted by the mining developments.

At Sydney a Baum coal washer was completed and put into operation, and reinforced concrete storage hoppers are being constructed to hold 6,000 tons of washed slack. They will be completed in the spring.

The new coal-shipping pier at Sydney is completed, except for the fittings, and will be ready to ship coal when navigation opens in the spring.

The increased output of the company has necessitated large additions to the rolling stock and motive power of the Sydney & Louisburg Railway, and the construction of additional branch lines and sidings, and passenger and freight accommodation. Extensions have been made to the car repair shops, machine shop, mine car shops, etc., and a large brick building has been provided for safe storage of patterns, the company's stock being both extensive and peculiar, and of course very valuable.

The Springhill mines steadily improved in outputs throughout the year, producing about 420,000 tons, compared with 266,000 tons in 1911.

The output for December was lessened by a fire that occurred in the No. 2 mine on Christmas Eve. The district affected by the fire was speedily isolated by concrete stoppings, and it is expected that mining operations in the No. 2 mine will have been resumed early in the New Year.

During the year the only additions to the existing equipment were a miners' wash house and a rescue station, equipped with the regulation Draeger apparatus and accessories.

Diamond drill prospecting has been carried along for some time past, and in all probability a new slope will be opened out early in 1913.

The Dominion Coal Company Employees' Benefit Society is becoming an important organization, and reflects the great expansion of the Coal Company's operations. The society was inaugurated in July, 1910, with a membership of under 7,000, and at the close of 1912 the membership numbered 11,120 persons. The income of the society in 1912 was approximately $144,000, $63,000 being contributed by the company, $11,500 by the Government of Nova Scotia, and $6,250 from interest on investments.

The expenditure totalled $98,600, of which amount $69,000 was paid out for weekly indemnity for disability caused by sickness and accident. For death claims $7,600 kas paid, and to widows and children $16,700, making a total paid out to dependents of deceased members of $24,300. At the end of the year there were dependent on the funds of the society, 86 widows and 293 children, an increase from the end of 1911 of 33 widows and 55 children.

The year was a disastrous one to shipping engaged in the coal trade. The "Bonavista," after a long career in carrying coal and passengers, became a total wreck in the Bay of Fundy.

The "Isleworth" was lost in the drift ice off the Nova Scotia coast in the spring, and the "Helvetia" was sunk in a collision with an "Empress' steamer in the St. Lawrence.

The "Gladstone" went aground below Quebec and was badly damaged. In none of these accidents was there any loss of life.

The "Morien" left Louisburg for Newfoundland in the middle of November and was lost with all hands, it is presumed, off Placentia Bay. A collision occurred between two "Black Diamond" boats in Sydney Harbor, which caused the loss of five lives.

Among publications of the year bearing on coal mining in the Province may be mentioned the report of Dean Fernow, of Toronto University, on "Forest Conditions of Nova Scotia." This report is the result of a reconnaissance survey of the Province, the expense having been defrayed by the Government of Nova Scotia, who allowed the report to be made public at the request of the Commission of Conservation. The supply of pit timber is becoming one of the problems of mining, even in Nova Scotia, and Dr. Fernow's report contains matter of considerable significance to colliery owners. Dr. Fernow states the forest resources of Scotia are "in danger of exhaustion within the next two decades," although they are capable under proper management "of forever producing, by annual increment, as interest, at least twice as much as is now being cut from capital stock."

The report corrects some popular misconceptions as to the rate of growth of forest trees, and points out that from 140 to 150 years is required to grow trees suitable for lumbering. One-fourth of the forest area of the Province is semi-barren of commercial trees because of repeated fires, and under the most favourable conditions of planting and exclusion of fires, these barrens could not be made to produce a marketable forest under at least one hundred years.

It is to be expected that Dr. Fernow's recommendations will lead to a more intelligent forestry policy in Nova Scotia, a matter in which the co-operation of the mining societies and colliery companies could doubtless be usefully enlisted.

Accompanying the report is the only small-sized coloured geological map of Nova Scotia the writer has yet seen. If a similar map were to accompany the Nova Scotia Mines Report, soon to be issued, it would be much appreciated.

Another publication containing a great amount of valuable data regarding Nova Scotian coals is "An Investigation of the Coals of Canada," prepared under the direction of Dr. Porter of McGill University, and published by the Government at Ottawa. Three out of six volumes are already issued. The work is encyclopaedic in its scope, and is strikingly illustrated.

The visit of the delegates to the Intefnational Geological Congress promised for the summer of 1913 is looked forward to with considerable interest, and it goes without saying these gentlemen will receive a warm welcome, and in addition will find many points of interest in our coal strata exposures and in methods of coal extraction in Nova Scotia.

## WAGES PAID IN ALBERTAN COLLIERIES.

From Annual Report of Department of Public Works.

The scale of wages paid in the Province at the end of the year 1911 shows increases over the wages paid in previous years.

The general wage schedule now being paid for day labour is as follows:

**Outside Wages.**

| | Per day. | Hours. |
|---|---|---|
| Fire bosses | $110.00 to $115.00 per month | |
| Bottom man | $2.89 | 10 |
| Slate pickers, boys | 1.37 | 10 |
| Slate pickers, men | 2.47 | 10 |
| Car oilers, men | 2.47 | 10 |
| Car oilers, boys | 1.65 | 10 |
| Tally boys | 1.37 | 10 |
| Teamsters | 2.89 | 10 |
| Blacksmith | 3.85 | 10 |
| Blacksmith's helpers | 2.90 | 10 |

| | | |
|---|---|---|
| Power house engineers | 3.85 | 12 |
| Power house engineers | 3.40 | 8 |
| Fan men | 2.90 | 12 |
| Hoisting engineers | 3.20 | 8 |
| Hoisting engineers | 3.78 | 10 |
| Hoisting engineers | 4.40 | 12 |
| Tail rope engineers | 3.63 | 8 |
| Tail rope engineers | 3.85 | 10 |
| Endless rope engineers | 3.30 | 10 |
| Box car loader engineer | 3.40 | 10 |
| Tipple engineer | 3.40 | 10 |
| Screen engine tender | 2.65 | 10 |
| Locomotive engineer | 3.40 | 10 |
| Locomotive switchman | 3.00 | 10 |
| Fireman | 2.89 | 8 |
| Fireman | 3.85 | 12 |
| Fireman's helper | 2.65 | 10 |
| Railway car helper | 2.60 | 10 |
| Tipple dumper, man | 2.89 | 10 |
| Tipple dumper's helpers | 2.64 | 10 |
| Tipple dumper, boy | 1.65 | 10 |
| Top eagers | 2.64. | 10 |
| Car repairer | 3.40 | 10 |
| Car repairer's helper | 2.90 | 10 |
| Breaker engineer | 3.40 | 10 |
| Fan fireman | 3.40 | 12 |
| Lampman (depending upon number of lamps and skill of man) | $2.47 to 2.89 | 8 |
| Lampman (depending upon number of lamps and skill of man) | $2.47 to 3.40 | 12 |
| Machinists | $3.40 to 3.85 | 10 |
| Machinists' helper | 2.90 | 10 |
| Ashman | 2.50 | 10 |
| Ashman | 2.89 | 12 |
| Wiper, man | 2.89 | 12 |
| Coupler, man | 2.47 | 10 |
| Coupler, boy | 1.65 | 10 |
| Breaker oiler | 2.89 | 11 |
| Washer or tipple oiler | 2.89 | 11 |
| Breaker picker boss | 2.89 | 10 |
| Timber framer | 3.40 | 10 |
| Timber sawyer | 2.64 | 10 |
| Box car shoveler | 2.89 | 10 |
| Breaker platform boss | 2.89 | 10 |
| Breaker platform men | 2.60 | 10 |
| Breaker screen men | 2.47 | 10 |
| Rock bank men | 2.47 | 10 |
| Dirt bank men | 2.47 | 10 |
| Finisher after box car loader | 2.47 | 10 |
| All other outdoor labour | 2.47 | 10 |

**Bee Hive Coke Ovens.**

| | |
|---|---|
| Levelling and drawing (6½ ton charge), per oven | $1.00 |
| Levelling and drawing (5-ton charge), per oven | .80 |
| Loading into box or open cars (over 200 tons per month), per ton | .17 |
| Loading into box or open cars (less than 200 tons per month), per ton | .16 |

| | Per day. | Hours. |
|---|---|---|
| Steam locomotive engineer | $3.40 | 10 |
| Motorman | 3.18 | 10 |
| Larryman | 2.47 | 10 |
| Plasterers | 2.47 | 10 |
| Carters and cleaners | 2.47 | 10 |
| All other labour | 2.47 | 10 |

**Belgian Coke Ovens.**

| | | |
|---|---|---|
| Ram engine man | 3.40 | 10 |
| Chargers | 2.89 | 10 |
| Clayers | 2.89 | 10 |
| Drawers | 2.89 | 10 |
| Loaders | 2.60 | 10 |

**Briquette Plant.**

| | | |
|---|---|---|
| Engineer | 3.86 | 12 |
| Briquetter | 3.97 | 12 |
| Briquetter's helper | 3.40 | 12 |
| Tar Melter | 2.89 | 12 |
| Labourers | 2.89 | 12 |

**Inside Wages**

| | | |
|---|---|---|
| Shotlighter | 3.30 | 8 |
| Bratticemen | 3.30 | 8 |
| Bratticeman's helper | 2.75 | 8 |
| Timberman | 3.30 | 8 |
| Timberman's helper | 2.75 | 8 |
| Tracklayers | 3.30 | 2 |
| Tracklayer's helper | 2.75 | 8 |
| Motorman | 3.05 | 8 |
| Motorman's helper | 2.75 | 8 |
| Locomotive engineer | 3.05 | 8 |
| Locomotive switchman | 2.75 | 8 |
| Drivers | 3.03 | 8 |
| Drivers, wet places | 3.30 | 8 |
| Drivers, spike team | 3.50 | 8 |
| Couplers, men | 2.75 | 8 |
| Couplers, boys | 1.65 | 8 |
| Switch boys | $1.37 to 1.65 | 8 |
| Door boys | 1.10 | 8 |
| Rope riders | 3.03 | 8 |
| Main and tail rope riders | 3.30 | 8 |
| Pushers | 2.75 | 8 |
| Buckers | 2.75 | 8 |
| Loaders | 2.75 | 8 |
| Miners | 3.30 | 8 |
| Miners, wet places | 3.75 | 8 |
| Rock miners | 3.75 | 8 |
| Timber handlers | 3.03 | 8 |
| Labourers | 2.75 | 8 |
| Cagers, slope and incline | 2.75 | 8 |
| Cagers, shaft | 3.30 | 8 |
| Machinemen | 3.75 | 8 |
| Machinemen's helper | 3.30 | 8 |
| Pumpmen | 2.75 | 8 |
| Pumpmen (A. R. & I. Co.) | 3.20 | 8 |
| Hoistmen | $3.03 to 3.30 | 8 |
| Drivers, boys | $1.65 to 2.75 | 8 |
| Grippers | 2.75 | 8 |
| Grippers, boys | $1.65 to 2.75 | 8 |
| Pipe fitter's helpers | 2.75 | 8 |
| Pick carriers | $1.35 to 2.75 | 8 |
| Clutchmen | 3.30 | 8 |
| Rollermen | 2.75 | 8 |

Miners on contract average from $3.50 to $6.00 per day of eight hours.

With the number of railways which are now being built and also those that are projected in all parts of the Province, the future of the coal trade for both steam and domestic coal can now be looked forward to with confidence, and although the output is increasing rapidly, the market appears to be increasing as rapidly. These new railways are not only the means of bringing new settlers into the Province, but are also the means of allowing coal to be transported to those districts where before it could not be obtained.

# THE YEAR IN ONTARIO.

By Thos. W. Gibson, Deputy Minister of Mines.

The year 1912 was probably the best that the mining industry in Ontario has yet seen. Not only have all the active mining camps been operating steadily and at a high rate of production, but in what is perhaps the most important camp of all—the Sudbury Nickel region—development work has revealed large reserves of ore, previously not known to exist.

Metalliferous mining has come to be so largely predominant in Ontario that the condition of this branch determines the condition of the industry as a whole, hence it is satisfactory to be able to say that in all the five metals which the mines of the Province yield in quantity, namely—silver, gold, iron, copper, and nickel, the situation and outlook has never been better.

## SILVER.

The mines of Cobalt may have reached their apogee, but they are still yielding about one-seventh of the world's production. In 1911, the output was 31,500,000 ounces, worth sixteen million dollars. In 1912, the figures when compiled will probably show a decrease in production of a million or a million and a half ounces, but this falling off is more than compensated for by a larger return for the year's yield, which was worth two and one-half or two and three-quarter millions of dollars more than in 1911, the average price of silver having gone up to a little over seven and one-half cents per ounce as compared with that year. Thus on a lessened output the dividend paying companies have been put in a position to make a larger distribution of profits.

The natural effect has been to stimulate interest in the Cobalt camp, and this effect has been increased by several interesting developments. One of these was the location by the Seneca-Superior Company of a first-class vein carrying high grade ore in the bottom of Cart lake. This lake occupies a depression in the conglomerate, here say 300 feet thick, and the vein was found by a cross-cut which was being driven across the lake bed. The property is held by the Seneca-Superior Company upon a lease from the owners, the Peterson Lake Company. A striking of rich ore by the Casey Cobalt mine on an outlier of conglomerate, some fourteen or fifteen miles away from Cobalt proper, shows the potentiality of that formation and the advisability of searching every square yard of it. Another event of some importance is the finding of good ore by the Beaver mine in the diabase underlying the Keewatin, though actual quantities have not yet been proven.

The history of any mining camp, so far as individual properties are concerned, is usually a checkered one; some mines improve with age, others pass quickly. The Nipissing, with its over-shadowing area, retains the lead in production; the Coniagas, with an occasional carload of rich ore and its steady outpour of concentrating rock, is followed closely by the La Rose, the oldest mine in the camp, by McKinley-Darragh-Savage, whose career has been one of striking success, and by the Crown Reserve whose little patch of 22 acres beneath the waters of Kerr lake, has been a veritable cave of riches. Buffalo maintains its position well, and the recrudescence of Cobalt Townsite was one of the features of the year. Temiskaming and Beaver, taken together, upheld the credit of southeastern Coleman, and Cobalt Lake reduced its output, and so, materially, did O'Brien, while Hudson Bay, in the extreme north of Coleman, slackened its pace. Trethewey also fell off, and Right of Way produced but little. In South Lorrain, Wetlauffer did fairly well, and in Gowganda, Miller Lake-O'Brien continued production from its veins in the diabase, and Mann Mines also began to yield. Millerett has been treating chiefly low grade ore.

The camp is making large strides in refining the ores on the spot. The Nipissing mill for high grade ore scored a decided success in metallurgical practice. With separate plants for treating high grade and low grade ore nothing now leaves the Nipissing except in the form of bullion. This is also practically the case with the Buffalo, and concentrating plants for low grade ore are numerous. One effect of this tendency is to cut down the shipments of ore and concentrates by rail, but it is all in the direction of larger profits.

An event of moment was the construction of the Temiskaming & Northern Ontario branch railway from Earlton to Elk lake. This has given a noticeable impetus to the development of a number of properties in that district, including the Donaldson (purchased by the Beaver Company), Beacon, Hitchcock, etc.

There were no labour troubles at Cobalt during the year, and little difficulty with hydraulic power.

## GOLD.

The Porcupine camp came into production during 1912, 40 stamps being in operation at the Dome mine, and 40 at the Hollinger. Smaller contributors were the McIntyre and Vipond. The yield of gold for the year was about two million dollars. A little of this came from mines in other districts, principally the St. Anthony at Sturgeon Lake, and the Cordova in Hastings county, but the bulk was from Porcupine. Interest is naturally great in the Hollinger mine, which began the payment of dividends in November, announcing the intention of making a distribution of profits every four weeks. No. 1 vein, which showed at the 100-foot level, a length of 1,000 feet, with a width of 8 feet, and \$31.54 of gold per ton, has been developed for a length of 839 feet. At the 200-foot level, where the width is 6.7 feet, it shows contents of \$45.74 per ton. This vein has been developed for 63 feet at No. 3 level, at which point it had a value of \$8.40 per ton. Under date of October 5th, General Manager P. A. Robbins, reported that up to that time 20,444 tons of ore from development, partly made up of waste rock inadvertently included from drifting and sinking, had been milled, and had shown an average value of \$19.70 per ton. Ore from stopes to the extent of 5,777 tons had been treated and had shown an average value of \$37.89 per ton. The average value of all ore removed from the mine up to that time was \$23.69 per ton, established by treating 26,221 tons of ore. The mill has been a success, inasmuch as while designed to handle 300 tons of ore per day, from 450 to 500 tons can be put through. Extraction from \$30.00 ore is 97 per cent.

Details have not yet been published as to the results at Dome, but it may be surmised that these have been satisfactory. Work here is entirely open cut, and schist as well as quartz is put through the mill.

Progress at Porcupine was impeded by a labor strike which broke out about the middle of November. The men refused to accept the proposed cut in wages which the mine owners claimed was justified by the reduction of living expenses consequent upon the introduction of the railway, and which left the scale at higher than the Cobalt rate. The close of the year saw the strike still unsettled, but apparently with a large number of miners leaving the camp and the fortunes of war in favour of the mine owners. The camp has at present a capacity of about 100 stamps, which will be added to during 1913, and a substantial production of bullion may be looked for.

The other gold districts, such as Swastika, Munro, Larder Lake, etc., witnessed considerable activity during the year, but in none of them has production yet been established on a permanent basis.

### IRON.

1912 was not conspicuous by a large production of iron ore, the Helen mine at Michipicoten being practically the only shipping mine. Developments of significance, however, were in progress on other properties, notably at Moose mountain and Magpie. At the former, a Gröndal concentration plant has been installed and is now practically in readiness to make shipments of briquettes containing 63 per cent. iron, and within the Bessemer limit for phosphorus and sulphur. At Magpie, a roasting equipment is nearing completion, costing perhaps $1,000,000. The object of the process is to eliminate the sulphur and carbon dioxide from the ore, which is largely sideritic. It is to be hoped these pioneer processes will justify themselves by their results, and so show the way for the utilization of the large bodies of low grade iron ore, chiefly magnetite, which exist in northern and northwestern Ontario.

### NICKEL AND COPPER.

The nickel mines of Sudbury now easily dominate the production of this metal for the world. Extensive boring by the diamond drill were made during the year, which show that the bodies of ore yet to be mined are very large. The Canadian Copper Company has proven the Frood, or No. 3 Mine, to contain many millions of tons, and though the nickel contents are not so high as at Creighton, the quantity of ore is said to be greater. It is stated that this company contemplates the enlargement of its mining and smelting operations to an extent that will enable it to handle 5,000 tons of ore per day. The Canadian Copper Company's existing smelting facilities were improved by the substitution of basic for acid converters and the introduction of reverberatory furnaces. The Mond Company had drills on the Frood Extension, and found the Frood orebody to cross their line at a depth of 600 feet. This company's new smelter at Coniston will be ready for operation in 1913. The Dominion Nickel Copper Company purchased the old Murray mine, formerly owned by the Vivians, who worked it for a number of years, since when it has been idle. This company has also bought the Gertrude and Elsie mines, owned by the Lake Superior Corporation. On the Murray, it placed seven diamond drills at work, and it is said that some six million tons of ore have been located about 400 yards west of the old workings. The company has moved the site of its proposed smelter from the Northern Nickel range to Snider township, so as to be closer to its new mines. On the T. & N. O. Railway, the Alexo Nickel mine, whose ore is similar to that of Sudbury, shipped several thousand tons to the Mond smelter at Victoria Mines. The output of nickel for 1912 will be about 21,000 tons, much the largest production ever made.

Copper in Ontario is really a by-product of nickel, and its production increase or decreases with that of the latter metal. In 1912, the yield was about 11,000 tons, a record quantity. The sulphide mines of the north shore are at present idle, notwithstanding the high price of copper. Some prospecting was done on low grade bodies of copper ore near Dane, on the Temiskaming & Northern Ontario Railway.

### NON-METALS.

Southwestern Ontario yields petroleum, natural gas and salt. The petroleum wells are declining in yield year by year, and the production will certainly be less than in 1911, when it was 10,000,000 gallons. There will be an increase of ten or fifteen per cent. in the output of natural gas, as compared with 1911. The salt industry expands slowly, and has an output of about half a million dollars in value per annum. Gypsum also continues to be raised in the valley of the Grand River, but the production is not large, although stimulated to some extent by the requirements for the manufacture of Portland cement, now being made in increasing quantities. The cement industry originated with the marl deposits of Addington and Grey counties, but the tendency of recent years has been to substitute solid limestone for marl, as being cheaper and yielding a cement not inferior in quality. The production of iron pyrites promises to become important. Its chief use is in the manufacture of sulphuric acid, of which large quantities are required in the manufacturing and chemical industries. There are a number of deposits in eastern Ontario, but the largest known bodies are in the northwestern portion of the province, one of which, on Lake Minnitakie, near the Grand Trunk Pacific Railway, is now under operation. Feldspar, graphite, talc, corundum, mica, and other mineral substances continue to be raised and treated in varying quantity from year to year, and the production of these in 1912 was about normal. Building operations were active in the cities during the year, and called for large quantities of brick, stone, and lime. Fortunately the raw materials for all three exist in almost unlimited quantity, and the production was very brisk. The quarries of Bancroft yield marble of great variety of shades and markings, quite equal to almost any demand for construction and decorative purposes. As by-products of silver mining, white arsenic and the oxides of cobalt and nickel are produced in large quantities. The cobalt trade of the world is now practically supplied from the ores of the Cobalt camp.

The value of the mineral production of the province for the year 1912, computed at the point and in the form produced, will be in the neighborhood of $45,000,000.

# BOOK REVIEWS.

**Cyanide Practice in Mexico—By Ferdinand McCann—199 pages—39 illustrations and 2 folding plates—Cloth—6 x 9 in.—$2 postpaid—Published by the Mining and Scientific Press, San Francisco—1912—For sale by the Canadian Mining Journal, Toronto.**

Although in most part a series of extracts from a volume written some time ago in Spanish by Mr. McCann, there is sufficient original matter in this little book to give it distinctiveness and freshness.

Short preliminary pages are followed by descriptions of cyanide practice at eleven important Mexican plants, such as El Oro, Guanajuato Consolidated, Esperanza, etc. Mr. D. L. H. Forbes, now of Toronto, and Mr. Bernard McDonald contribute a chapter each.

The five concluding chapters take up, respectively, cyanide practice in small mills, continuous cyanide treatment in connection with the Pachuca tank, cyanidation in pan-amalgamation mills without change in the machinery, precipitation on metallic zinc, and treatment of cyanide precipitates.

Mr. McCann has paid especial attention to the cyanidation of silver ores; in fact, his book is the best source of reference that we have seen on this important subjest. The illustrations include the flow-sheets of many typical mills.

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**Coal—Its Composition, Analysis, Utilization, and Valuation—By E. E. Somermeier, Professor of Metallurgy, Ohio State University—175 pages—Illustrated—Board covers—Price $2.—Published by McGraw-Hill Book Company, New York—1912—For sale by the Canadian Mining Journal.**

It is unfortunate that the first prefatory page of "Coal" contains an inexcusable grammatical blunder. Prof. Somermeier deliberately uses the phrase "this data." Both author and publisher are to blame for this solecism.

The purpose of "Coal" is to throw into readable shape material concerning the physical and chemical qualities of coal, and concerning, also, its uses. The chapter headings give an idea of the ground covered. They are: Composition and Heating Value, Chemical Analysis, Sampling, Methods of Analysis, Determining the Calorific Value, Summary of Chemical Records, Improvement of Coal by Washing, Purchase of Coal under Specifications, Flue Gas Analysis, and Analytical Tables. The tables include a comparison of the composition and heating value of air, dried wood, peat, lignite, bituminous coals, semi-bituminous, and anthracite. This is followed by a lengthy tabulation of the composition of typical coals from all over the United States. No Canadian fuels are touched upon. In the chapter on specification purchase, we note that the city of Toronto's standard is quoted. Here 13,000 B.T.U. is taken as a basis, with 10 per cent. ash, 2 per cent. moisture, and 1½ per cent. sulphur. Coals that do not come up to these specifications may be accepted or rejected; but, if accepted, the price is adjusted to the actual calorific value of the fuel.

"Coal" should prove a useful book, although its treatment is rather slight than otherwise.

**Building Stones and Clay Products—A Handbook for Architects—By Heinrich Ries, Ph.D.—8vo, XIII 415 pages—Fully illustrated—Cloth cover—Price $3.—Published by John Wiles & Son, New York, 1912—For sale by the Canadian Mining Journal.**

Dr. Ries is too well known to the Canadian public and to Canadian mining men to need an introduction. He has made himself a world-recognized authority on economic geology, and has devoted much time to special research in ceramics and clay products generally. Thus the reader can accept his latest book with the comfortable assurance that it is as sound and modern as it can be.

The possibilities of Canadian building stones and clay products have too long been neglected. This fact has been recognized by our Dominion Mines Branch, and that organization is collecting and distributing much valuable information. Obviously, Dr. Reis' volume has made a timely appearance. Though designed primarily for the architect, the mining man will find a fund of helpful and suggestive information within its covers.

The sequence of subjects dealt with is as follows: After treating rock minerals and rocks, and the properties of building stone, Dr. Ries takes up granites, gneisses, sandstones, limestones, marbles, slates, and serpentine. He then proceeds to discuss the the properties of clay, building brick, architectural terra cotta, structural hollow-ware, roofing tile, wall and floor tile, sewer pipe, and sanitary ware.

A sufficient geological and technical glossary is appended.

The paper used is of excellent quality, the type is clear, and the general make-up is up to high standard that one expects from John Wiley & Sons.

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**Introduction to the Study of Minerals—A Combined Text-book and Pocket Manual—By Austin Flint Rogers, Ph.D.—522 pages—Illustrated—Soft cover—Price $4.—Published by McGraw-Hill Book Company—1912—For sale by the Canadian Mining Journal.**

Dr. Rogers has sought to combine in this volume the class text-book and the field hand-book. This is a laudable object, inasmuch as it obviates duplication and saves expense.

Apart from the usual information, there are several distinctive features in the book. For instance, there are descriptions of the optical and microscopic properties of crushed fragments, cleavage flakes, and recrystallized products. There are also number lists of the paragenetic varieties of each mineral.

A select bibliography and a glossary add to the value of the book. The determinative section is carefully compiled. The arrangement of symbols and abbreviations is good.

# ATLIN MINING DIVISION, BRITISH COLUMBIA

The following information concerning last year's mining operations in Atlin mining division, British Columbia, has been obtained from sources believed to be dependable.

Owing to the unusual shortage of water for gravel-washing purposes, not nearly so much placer mining was done as would have under less unfavourable conditions in this respect. Notwithstanding this drawback, it is expected the quantity of gold recovered will be found to have been greater than that reported as the yield in 1911—possibly to the extent of 25 per cent. increase. This, however, will not be definitely ascertainable until the returns shall all be in.

Placer mining was done on various streams, as follows: On Pine, Spruce, McKee, Birch, Boulder, Ruby, Wright, Otter, Wilson, Lincoln, and Davenport creeks, and on O'Donnell river.

### On Pine Creek.

On Pine creek, the North Columbia Gold Mining Company, under the management of Mr. J. M. Ruffner, operated throughout the season at a disadvantage,owing to not being able to use as much water as was required, notwithstanding that it had the reservoir of Surprise lake to draw from. At no time in 1912 was it practicable to flush out the creek channel and thus get rid of the tailing, in consequence of which the recovery of gold was on the whole less than in the 1911 season, although in one of the pits the yield was better than ever before. In the season before, the company employed a varying number of men, sixty having been the maximum at any one time, and from six to fifteen monitors, mostly of large size, were used during the season; corresponding particulars for 1912 have not yet been received, but it is understood the season was an active one and results fairly satisfactory under the circumstances.

### On Spruce Creek.

Operations on Spruce creek in both 1910 and 1911 seasons gave employment to about seventy men: more than half of this number were individual miners. In 1912, however, fewer properties were worked, yet, this notwithstanding, it is thought there was in the last mentioned year an increase in the quantity of gold recovered.

### On Ruby Creek.

The Placer Gold Mines Company, with Mr. T. M. Daulton as manager, has been operating on Ruby creek several seasons. Prior to 1912 much development work was done, chiefly in hydraulicking a channel down to bed-rock, working up-stream on grade. During the time this work was in progress the production of gold was small from this creek, but last season there was a substantial increase. Toward the close of the season rich ground was worked; this was previously known to exist here, but it was never before reached by hydraulic operations. It may be expected that next season a further increase in production of gold will take place on this creek.

### On Several Other Creek.s

Lack of water caused a marked decrease on several other creeks of those mentioned earlier. It was expected that much dead-work done on Birch creek in 1911 would have led to a good showing being made in 1912, but this expectation was not realized. On Boulder creek in past years the Societe Miniere de la Colombie Britannique has done much dead-work searching for a deep-gravel paystreak, but results have not yet proved satisfactory. The Pittsburg-British Gold Company—the Hamshaw property—has been operating on McKee creek for several years, but no information is available concerning this organization's work in 1912. Wright creek in recent years has had only a few individual miners working on it. The Otter Creek Development Company's leases are on the upper part of Otter creek, and those of the Maluin Syndicate on the lower; both companies have done much development and prepared for washing a lot of gravel, but they appear to have had a disappointing season in 1912. Wilson creek has been worked by a few individual miners; the 1912 results from operations on this stream were small. On Lincoln and Davenport creeks and O'Donnell river last seasons work was entirely of a prospective nature; results were encouraging, however, and good returns in the future are looked for. The Canadian-Alaska Exploration Company, with Mr. Robert McKee as manager, has done much work on O'Donnell river, preparatory to installing either a steam shovel or a dredging plant, prospects having been adjusted good enough to warrant the provision of facilities for handling a large quantity of gravel

### New Discoveries.

A discovery of rich gravel was made on O'Donnel river, on one of the benches, but there was not sufficient prospecting done before the close of the season to determine whether its extent was considerable or only small.

Late in the season a number of locations were made on Burdette creek, a tributary of O'Donnell river. This creek is a new one on the list of those on which gold has been found. Other tributaries of that river also had attention, and locations were made on them, so that indications point to activity in placer mining on these various streams next season.

New discoveries were also reported to have been made, just before the close of the season, on creeks tributary to Teslin lake, and a number of individual claims have been located there. The gold shown as having been found on these creeks is very coarse and clean and of high quality. These discoveries are also in Atlin mining division.

### Quartz Mining Near Atlin.

Very little was done in 1912 in connection with quartz mining in Atlin division—not much more than the work requisite to keep the claims in good standing, excepting on the Engineer or Northern Partnership group and the Ben M'Chree group, both situated on Taku arm. On the former more than thirty men were employed throughout the season, prospecting and developing, and with surprising results, suggesting that the possibilities of this property are beyond the most sanguine expectations of the original holders. The latter group, which is situated at the extreme south end of Taku arm, was acquired during 1912 by some British capitalists, who have done considerable prospecting work, and made arrangements for construction of an aerial tramway, and the provision of other facilities for development and exploitation, from which important results are expected.

In Rainy Hollow country nothing was done beyond the necessary assessment work on claims not yet Crown granted. The chief reason for this was that most of the properties had been bonded early in the season to representatives of capital. Meanwhile the owners developments, but those to whom the claims had been bonded did not get so far as to commence mining work.

### Another View of the Position.

From another source the following has been received: A general review of work done on the creeks around Atlin during the 1912 season shows that there was greater activity and better results last season than for any corresponding period during several preceding years; also, that the prospects for the coming season are excellent.

Among quartz properties, the Engineer group is opening up marvellously, and there is no longer any doubt of the great value of this property. Lawson's group has also passed the probation stage, and is now regarded as being among the certainties as a paying mine. The Ben M'Chree continues to please it holders, who are preparing to next season also develop in a systematic manner the White Moose property. The work done on these properties in 1912 has shown the great mineral value stored up in this district, and has demonstrated that there may be expected many years of greater activity in mining here than the most sanguine have been looking for.

Much prospecting was done during the 1912 season, and just at its close W. Shea, an old prospector, reported having found rich gold on one of the benches of O'Donnell river. Since then other reports have been received, with the result that the benches along that river have been staked for miles, in claims and leases.

Some Indians, too, have come in and recorded discovery claims on four creeks south of Tesline lake, and have stated that they found placer gold on these at depths varying from one foot to four feet. They assert that gold can be found in all the creeks at the depth of the shovel, and they are showing faith in their discoveries by taking out miners' licenses and staking for themselves and family connections. White men have been listening intently to their stories (late in November), and already the pathfinders are on their way to the new field. Without doubt Atlin division will have a mild rush next spring, and will again rank as one of the live mining camps of the North.

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# COLLIERY EXAMINATIONS

Abstract from the Annual Report of the Department of Public Works, Province of Alberta.

The number of candidates who presented themselves for examination during the year 1911, shows a considerable increase over the previous year, and with the steadily increasing number of mine officials qualifying each year, there should soon be no difficulty in securing a sufficient number of certified persons to fill all official positions at the mines.

The following are the questions set at the mine managers' examination held at Frank, Banff and Edmonton on September 13th, 14th and 15th, 1911:

### Mine Manager's Examination.

Paper No. 1. Time allowed, one and a half hours.

Candidates must obtain 70 per cent. of the alloted marks to pass.

### Coal Mines Act.

1. State the provisions of The Coal Mines Act as to—
   (a) Inspection of workings;
   (b) Safety lamps;
   (c) Ventilation. (15)
2. Describe briefly the duties of (a) a Mine Manager, and (b) a Pit Boss, as laid down by The Coal Mines Act. (10)
3. What are the provisions of The Coal Mines Act
4. State the rule as to the examination of a mine by the workmen, and say why, in your opinion, this rule is not more generally taken advantage of.
5. What are the provisions of The Coal Mines Act with regard to manholes? Are manholes required on a self-acting incline 90 yards long, on which workmen regarding Check-weighmen? (6)
are forbidden to travel, there being a separate travelling road? (10)
6. What accidents should be reported to the District Inspector of Mines, and to the Minister of Public Works; and what are the provisions as to the reports? (9)
7. State briefly the provisions of the Act with regard to the use and handling of explosives in mines. (14)
8. What annual returns have to be made by the owner, agent or manager? (7)
9. State briefly the provisions of the Act regarding "shafts" and "outlets." (10)
10. State the provisions of the Act with regard to the fencing of—
   (a) Places not in use;
   (b) Shafts. (11)

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### Mine Manager's Examination.

Paper No. 2. Time allowed, two and a half hours.

Candidates must obtain 70 per cent. of the allotted marks to pass.

### Gases and Shot-Firing.

1. State what gases are given off as the result of spontaneous combustion, and discuss fully their properties. (11)
2. The quantity of air passing into a mine, measured on the intake, is 115,000 cubic feet per minute, the temperature being 65 degrees F. If the quantity measured on the return of the same air-current is 118,500 cubic feet per minute, and the temperature at this point is 72 degrees F., what per cent. of mine gases is present in the return current as it leaves the mine? (10)
3. Give your opinion as to the propagation of flame in mine explosions and discuss the different methods which are adopted for arresting the same. (9)
4. What is afterdamp, and what would be the composition of the afterdamp resulting from an explosion of firedamp containing a large quantity of air; and what would it likely be if the firedamp contained a small quantity of air? (10)
5. Explain (a) the principle features of the safety lamp, (b) the effect of the several illuminants used, and (c) state what principles control or determine the dimensions of safety lamps. (10)
6. (a) State the different kinds of explosives used in mines in the Province. (b) Give your views as to

the best kind of explosives adapted to the various conditions. (c) State your views as to the best methods of handling and caring for explosives. (d) State the methods in use for drilling holes for explosives, and what suggestions you would make, if any, for improvement in such methods. (12)

7. The air current in a certain mine is charged with marsh gas to the extent of 3 per cent., when the water gauge reading is 2.5 inches. What would be the percentage of gas in the current if it became necessary to reduce the speed of the fan till the water gauge gave a reading of only 1 inch? (10)

8. Describe the principle and practice of electric blasting. What are the dangers of shot-firing in a dry and duty mine; and what precautions would you take in performing this work? (11)

9. What do you understand by the term "diffusion of gases" and what instances do you know that appear contrary to that principle? (7)

10. Describe the safety lamp, giving an explanation why it is considered and called a safety lamp. Name the different types of safety lamps with which you are familiar. States which lamp you prefer for the use of a miner, and which for the use of a fire boss, giving reasons. (10)

### Mine Manager's Examination.

Paper No. 3. Time allowed, three and a half hours.

Candidates must obtain 70 per cent. of the allotted marks to pass.

#### Ventilation.

1. What observations and data are required to determine the quantity of air circulating in a mine, and the efficiency of the ventilating appliances? (10)

2. Name the three main qualities of a ventilating fan, and show how, having regard to the thickness of seam and the length of airways, you would determine the type and size of fan to be used. (9)

3. A current of 30,000 cubic feet of air per minute is split into two airways, A and B. Split A is 5 ft. x 8 ft. and 10,000 feet long. If split B is 5 ft. x 7 ft., what length must it be to take one-half the air, no regulators being used? (10)

4. A fan 16 ft. x 8 ft., running at a speed of 100 revolutions per minute, produces 125,000 cubic feet of air under a water gauge of 2 inches, at a certain mine; what would be the required speed of this fan and the water gauge to produce a circulation of 150,000 cubic feet of air per minute in the same mine? (11)

5. State to what extent the air current in a mine can be split keeping in view the efficient ventilation of the working places. What advantages are obtained by splitting air currents over a single continuous current in ventilating a mine? Compare the advantages and disadvantages of the different means of producing ventilation in mines with respect to their safety, effectiveness and economy. (14)

6. If 15,000 cubic feet of air per minute pass along an airway 6 ft. high by 5 ft. wide and 1,600 feet long, what will the quantity be when the length is increased to 2,500 feet, the pressure remaining the same? (8)

7. What is a water gauge, a barometer, and a hyrometer; and for what purposes are they used in connection with mining? (9)

8. The temperature in a mine being 63 degrees F. the velocity of the air current 345 feet per minute, and the size of the airway 6 ft. 6 inchs. by 8 ft. 3 ins., what weight of air is travelling per minute? (9)

9. How would you increase the volume of air in a mine without increasing the power? (6)

10. Make a neat sketch of pillar and room workings for a mine employing 145 men. Show number of workmen in each district, course of ventilation, showing air splits and crossings, stoppings, doors and regulators. Give size of return airway, also quantity of air in each split. (14)

### Mine Manage's Examination.

Paper No. 4. Time allowed, four hours.

Candidates must obtain 60 per cent. of the allotted marks to pass.

#### Practical Work.

1. Describe with sketches the different methods with which you are familiar, of extracting pillars having due regard to the greatest degree of safety to the miners and the recovery of the largest percentage of the coal. (10)

2. Describe some form of coal cutting machine with which you are familiar, and state in what seams they are to be preferred to manual labour, having regard to the thickness of coal, nature of roof and pavement. (9)

3. Describe how you would arrange your men and material for retimbering an engine haulage road without interfering with the traffic on it which occupies eight out of the twenty-four hours. It is 10 feet wide and 6 feet high within the existing timbers. The upright and crown-trees are 2 feet apart and there are to be no trees in the centre of the road. Sketch side and end views, showing how you would place the new timber in relation to the old, and if you would take out the old which is supposed to have some strength left in it. The roof is composed of 5 feet of soft shale up to a 6 feet bed of sandstone. When in your opinion is the proper time to prop such a roof for a haulage road with permanent timber, immediately on being worked or later on? (11)

4. Describe two systems of working coal with which you are acquainted, and state under what circumstances as to thickness of the seam, nature of the coal, and state of the roof and pavement, you would adopt one in preference to the other, always keeping in view the working of the coal in the easiest and cheapest manner, consistent with the safety of the men and the production of the greatest amount of lump coal. (12)

5. What chemical and geological features are there in and adjacent to a coal seam which make it susceptible to spontaneous combustion? (7)

6. Describe the general principles of a breathing apparatus for rescue work in mines and discuss the favourable and unfavourable features of such an invention. (8)

7. A hole $1\frac{1}{2}$ inches in diameter is bored into old workings containing water. The head of water is 66 feet, and length of bore hole is 25 feet. How many gallons of water will be discharged per minute at the orifice? (7)

8. What are the dangers of the presence of coal dust underground and how may they be mitigated? Describe some of the precautions that you would take to guard against accidents therefrom. (12)

9. Describe fully some method by which you would sink a large rectangular shaft through heavily watered quicksand, and state what are the limits, if any, to the use of the method which you describe. (12)

10. Suppose you are opening up a new mine in a flat seam; what would determine the kind and size of fan you would equip your mine with, and whether you would open up with a double or triple entry system,

which would you use for intake, and which for return airway? Where would you place your fan and what precautions would you take to preserve it in case of an explosion? (12)

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### Mine Manager's Examination.

Paper No. 5. Time allowed, three and a half hours.
Candidates must obtain 60 per cent. of the allotted marks to pass.

#### Machinery.

1. Explain what is meant by each of the terms: "Heating Surface." Steam Room," "Atmospheric Pressure" and "Latent Heat." (8)

2. Enumerate the different causes of incrustation in a steam boiler. What kind of incrustation does the most harm to a boiler and in what manner may it cause an explosion? (7)

3. In a slope which is 900 feet in length and has an average pitch of 30 degrees, the quantity of water accumulating is 250,000 gallons per day. Give the size of the pumps and the required speed of the same to remove this water by pumping 8 hours per day? (10)

4. What thickness should a cast iron pipe 6 inches in diameter be made to have a bursting pressure of 4,000 pounds per square inch? (6)

5. What size of haulage engine would be required to haul an output of 100 tons per hour up an incline 1,000 yards in length, with a gradient of 1 in 6? (9)

6. A compound, triple-expansion, three-cylinder engine takes steam from boilers at 192 pounds absolute pressure, and exhausts at 3 pounds absolute; what is the total number of expansions in the steam, and what number of expansions takes place in each cylinder? Give also the cut-off and the relative areas necessary in order to equalize the work of each cylinder. (10)

7. To what use is electricity applied in the operation of coal mines? What are the advantages and disadvantages of using electricity for power or other purposes? State the conditions under which you would recommend the use of electricity for power in mines. What dangers are attendant on its use and what precautions should be taken to insure safety to those employed in the mine? (11)

8. What size of rope should be used to hoist 4,000 pounds of coal at one time? The car, cage and rope weighing 3,500 pounds. (5)

9. Describe fully—
   (a) An appliance for the prevention of overwinding in shafts;
   (b) An automatic arrangement of cut-off for winding engines. (8)

10. Describe any form of compound (2 stage) air compressor. When using a large number of drills underground, what precautions would you take and how would you arrange matters so as to make the most efficient and economical use of the compressed air at your disposal? (9)

11. Describe fully, with sketches—
   (a) How a detaching hook should be connected to the cage;
   (b) Two methods of capping a steel wire rope;
   (c) The precautions to be taken in order to see that a detaching hook is always in a safe and good working order. (10)

12. (a) What is a safe voltage to use in a mine for electric haulage? (b) If the generators are producing a 500-volt current what is necessary to be done to retain the same power but reduce the voltage to 250 volts? (10)

### Mine Manager's Examination.

Paper No. 6. Time allowed, four hours.
Candidates must obtain 60 per cent. of the allotted marks to pass.

#### Levelling.

1. Describe fully the ordinary process of levelling, stating any precautions required to ensure accuracy. (10)

2. Give a page from an imaginary level book, showing at least eight readings obtained by two settings of the instrument. (18)

3. Work out and plot the section which you have given in question 2, to any convention scale. Mark on the profile the number and elevation of each station. (16)

4. What is the average grade from the point of starting to the finish of the level, in question 2? Show grade by line drawn on profile. (11)

5. Suppose you are required to take levels along an underground roadway in order to plot a section showing both roof and floor, state what instruments you would use and how you would proceed. (11)

6. What are the benefits, present and future, of having the levels of main roads put on colliery plans? (9)

7. How would you proceed to level along an inclined road, which is 3 ft. 9 ins. high and inclined at an angle of 44 degrees? (11)

8. describe an engineer's level and say how you would determine if the instrument is in proper adjustment. (14)

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### Mine Manager's Examination.

Paper No. 7. Time allowed, three and a half hours.
Candidates must obtain 60 per cent. of the allotted marks to pass.

#### Surveying and Mapping.

1. Explain the terms diurnal variation, dip, declination and secular variation of the magnetic needle. (9)

2. What are the requirements of The Coal Mines Act as to working plants for mines? What further information should they afford in addition to what is legally required? (11)

3. Calculate by sines and cosines the bearing and length of the closing line of the following traverse:

| Station. | Azimuth. | Distance. |
|---|---|---|
| 0 to 1...... | 31 degs. 28 mins...... | 87 feet. |
| 1 to 2...... | 351 " 35 " ...... | 138 " |
| 2 to 3...... | 276 " 15 " ...... | 168 " |
| 3 to 4...... | 149 " 25 " ...... | 103 " |
| 4 to 5...... | 69 " 15 " ...... | 63 " |
| 5 to 6...... | 221 " 15 " ...... | 137 " |
| 6 to 7...... | 111 " 13 " ...... | 91 " |
| 7 to 8...... | 49 " 40 " ...... | 53 " |

(12)

4. Plot the traverse given in question 3 on a scale of 50 ft. to 1 inch and draw the closing line from Station 0 to Station 8. (16)

5. Give a general description of the theodolite and explain the method in which you would use it in making an underground survey. (9)

6. Describe the true meridian as compared with the magnetic meridian. How does the adoption of the latter affect plans made from compass observations and added to as in mine plans from year to year? (10)

7. How would you proceed to put up sights in a room, the course of the entry being given as N. 86 deg. E. and the rooms to be turned to the left, and to make with the entry an angle of 72 degrees? (12)

8. In the case of a mine with only one shaft, which is vertical and where there is iron, which cannot be removed, in every part, explain how to connect the underground with the surface survey. (9)

9. Give sketch and dimensions of a mine car to hold 2,500 pounds of screened coal after there is 42 per cent. of screenings taken out of the car. The coal is to be loaded one foot above the car. The specific gravity of the coal is 1.25. (12)

# COAL MINES BRANCH OF THE PROVINCE OF ALBERTA

From the Annual Report (1911) of the Department of Public Works.

It will be noted from the following tables that the output for the year 1911 shows a decrease of 1,342,193 tons below the year 1910. This is due to the fact that operations were discontinued in all the large mines in the southern part of the Province owing to a strike which extended for a period of practically eight months.

| | Output Alta. & Sask. | Output Alta. |
|---|---|---|
| 1901 | 346,649 | ........ |
| 1902 | 510.674 | ........ |
| 1903 | 622,939 | ........ |
| 1904 | 782,931 | ........ |
| 1905 | ...... | 811,228 |
| 1906 | ...... | 1.385,000 |
| 1907 | ...... | 1,834,745 |
| 1908 | ...... | 1.845,000 |
| 1909 | ...... | 1.845,000 |
| 1909 | ...... | 2,174,329 |
| 1910 | ...... | 3.036,757 |
| 1911 | ...... | 1,694.564 |

The above figures show that there has been a decrease of 44.19 per cent. below the 1910 output.

**Classification of Output of Coal in Alberta During the Year 1911.**

| | Tons. |
|---|---|
| Lignite coal | 964,700 |
| Bituminous coal | 649.745 |
| Anthracite coal | 80,119 |
| Coal used in coke production | 61,591 |
| Coke produced | 35.984 |
| Briquettes produced | 48,200 |

The above table shows that there has been an increase of 9.87 per cent. over the output of lignite coal for the year 1910, and decreases of 65.74 per cent. of bituminous, and 69.39 per cent. for anthracite coal below the outputs for the year 1910.

The following table indicates how the bituminous coal outputs from the different districts in the Province were disposed of:

| Tons of 2,000 lbs. | Crow's Nest Pass. | Calgary. | Lethbridge. | Edmonton. | Total. |
|---|---|---|---|---|---|
| Sold for consumption in Alberta | 309,512 | 88,609 | ...... | 10,619 | 408,740 |
| Sold for consumption in other Provinces | 64,354 | 113 | ...... | ...... | 64.467 |
| Sold for export to the United States | 36,016 | ...... | ...... | ...... | 36.016 |
| Total sales | 409.882 | 88,722 | ...... | 10.619 | 509.223 |
| Used in making coke | 61.591 | ...... | ...... | ...... | 61,591 |
| Used under colliery boilers | 41,433 | 9,377 | ...... | 3.500 | 54,310 |
| To stock | 15,213 | 174 | ...... | 9,234 | 24,621 |
| Total | 528,119 | 98,273 | ...... | 23,353 | 649,745 |

The following table indicates how the anthracite coal and briquette outputs of the Province were disposed of:

| Tons of 2,000 lbs. | Calgary District. Coal. | Briquettes. |
|---|---|---|
| Sold for consumption in Alberta | 25,677 | 23,965 |
| Sold for consumption in other Provinces | 5,705 | 23,981 |
| Sold for export to the United States | ...... | 30 |
| Total sales | 31,382 | 47,976 |
| Used under colliery boilers | 10,878 | 224 |
| Used in making briquettes | 37,859 | ...... |
| Total | 80,119 | 48,200 |

The following table indicates how the lignite coal outputs from the different districts in the Province were disposed of:

| Tons of 2,000 lbs. | Crow's Nest Pass. | Calgary. | Lethbridge. | Edmonton. | Total. |
|---|---|---|---|---|---|
| Sold for consumption in Alberta | 213 ...... | 55,196 | 181,092 | 377,745 | 614,033 |
| Sold for consumption in other Provinces | ...... | 6,937 | 166,386 | 70,038 | 243,361 |
| Sold for export to the United States | ...... | ...... | 4,578 | ...... | 4,587 |
| Total sales | ...... | 62,133 | 352,055 | 447,783 | 861,981 |
| Used under colliery boilers | ...... | 4,116 | 51,752 | 13,533 | 69,401 |
| Slack | ...... | 1,392 | 7,979 | 23,947 | 33,318 |
| Total output | ...... | 67,641 | 411,796 | 485,263 | 964,700 |

The following table indicates how the output of coke was disposed of:

| | Tons of 2,000 lbs. |
|---|---|
| Sold for consumption in Alberta | 213 |
| Sold for consumption in other Provinces | 27,669 |
| Sold for exports to the United States | 7,871 |
| Total sales | 35,753 |
| For colliery use | 463 |
| Total output | 36,216 |

The Crow's Nest Pass is the only district in the Province in which coke is produced.

The following summary shows the total sales of coal, briquettes and coke of the Province:

| Tons of 2,000 lbs. | Sold in Alta. | Sold other Provs. | Sold U.S. | Total. |
|---|---|---|---|---|
| Bituminous coal | 408,740 | 64,467 | 36,016 | 509,223 |
| Anthracite coal | 25,677 | 5,705 | ...... | 31,382 |
| Lignite coal | 614,033 | 243,361 | 4,587 | 861,981 |
| Total sales | 1,048,450 | 313,533 | 40,603 | 1,402,586 |
| Briquettes | 23,965 | 23,981 | 30 | 47,976 |
| Coke | 213 | 27,689 | 7,871 | 35,753 |

The following table shows the classification of persons employed above and below ground in cituminous fields:

| Average Number Employed. | Crow's Nest. A. | B. | Calgary. A. | B. | Edmonton. A. | B. | Total. A. | B. |
|---|---|---|---|---|---|---|---|---|
| Supervision and clerical assistance | 80 | 63 | 8 | 16 | 5 | 4 | 93 | 83 |
| Miners and helpers | .. | 829 | .. | 268 | .. | 43 | .. | 1140 |
| Mechanics or skilled labour | 170 | 47 | 22 | 10 | 14 | 2 | 206 | 59 |
| Other employees | 420 | 421 | 69 | 115 | 33 | 2 | 522 | 538 |
| Total | 670 | 1360 | 99 | 409 | 52 | 51 | 821 | 1820 |

The following summary shows the classification of persons employed above and below ground in the lignite fields:

| Average Number Employed. | Calgary. A. | B. | Lethbridge. A. | B. | Edmonton. A. | B. | Total A. | B. |
|---|---|---|---|---|---|---|---|---|
| Supervision and clerical assistance | 17 | 15 | 56 | 46 | 68 | 51 | 141 | 112 |
| Miners and helpers | .. | 112 | .. | 1287 | .. | 684 | .. | 2083 |
| Mechanics or skilled labour | 20 | 4 | 145 | 26 | 80 | 19 | 245 | 49 |
| Other employees | 26 | 5 | 360 | 161 | 288 | 78 | 674 | 244 |
| Total | 63 | 136 | 561 | 1520 | 436 | 832 | 1060 | 2488 |

The following table shows the classification of persons employed above and below ground in the bituminous, anthracite, and lignite fields:

| Average Number Employed. | Bituminous. A. | B. | Anthracite. A. | B. | Lignite. A. | B. | Total. A. | B. |
|---|---|---|---|---|---|---|---|---|
| Supervision and clerical assistance | 93 | 83 | 12 | 8 | 141 | 112 | 246 | 203 |
| Miners and helpers | .. | 1140 | .. | 150 | .. | 2083 | .. | 3373 |
| Mechanics or skilled labour | 206 | 59 | 9 | 1 | 245 | 49 | 460 | 109 |
| Other employees | 522 | 538 | 270 | 50 | 674 | 244 | 1466 | 832 |
| Total | 821 | 1820 | 291 | 209 | 1060 | 2488 | 2172 | 4517 |

| | Gross Tons. | Men. | Tons per man. | Under. | Tons per man under. |
|---|---|---|---|---|---|
| 1906 .. .. | 1,358,000 | 2,800 | 494 | 2,000 | 692 |
| 1907 .. .. | 1,834,745 | 3,600 | 509 | 2,700 | 679 |
| 1908 .. .. | 1,845,000 | 3,780 | 488 | 2,681 | 688 |
| 1909 .. .. | 2,174,329 | 5,207 | 417 | 3,893 | *566 |
| 1910 .. .. | 3036,757 | 5,818 | 504 | 4,090 | 742 |
| 1911 .. .. | 1,694,564 | 6,689 | 253 | 4,517 | **375 |

*During the year 1909, a strike affecting all the larger mines in the Province lasted for a period of three months.

**During the year 1911, a strike affecting all the larger mines in the Province lasted for a period of eight months.

### Summary of Statistics.

| | |
|---|---|
| Number of mines at present in operation ... | 224 |
| Number of new mines opened in 1911 ...... | 68 |
| Number of mines abandoned in 1911 ...... | 26 |
| Number of tons of coal mined in 1911 ...... | 1,694,564 |
| Number of tons of coke produced in 1911 ... | 35,984 |
| Number of tons of briquettes produced ..... | 48,200 |
| Average number of persons employed inside mines ........ | 4,517 |
| Average number of persons employed outside mines ........ | 2,172 |
| Average number of persons employed inside the mines during December, 1911 ........ | 4,734 |
| Average number of persons employed outside the mines duing December, 1911 ......... | 2,312 |
| Number of separate accidents causing loss of life ........ | 6 |
| Number of deaths caused by accidents inside the mines ........ | 7 |
| Number of deaths caused by accidents outside the mines ........ | ...... |
| Number of serious accidents inside the mines | 29 |
| Number of serious accidents outside the miles ........ | 3 |
| Number of slight accidents inside the mines. | 38 |
| Number of slight accidents outside the mines | 7 |
| Number of mine managers' certificates issued | 19 |
| Number of pit boss certificates issued ...... | 21 |
| Number of fire boss certificates issued ...... | 51 |

### Explosivs.

The following tables showing the quantity of the various kinds of explosives used during the year in mines, the estimated number of shots fired, the methods of firing them and the number of miss-fires recorded, have been compiled from returns furnished by the mine owners:

Quantity of Explosives Used in Lbs.

| Name of Explosive. | Crow's Nest Pass. | Leth-bridge. | Cal-gary. | Edmon-ton. | Total. |
|---|---|---|---|---|---|
| Black podwer ....... | | 124,647 | 38,658 | 128,026 | 291,331 |
| Monobel ...... | 109,067 | 9,794 | 22,607 | 11,890 | 153,358 |
| Samsonite ..... | 3,800 | ....... | 2,544 | ....... | 6,344 |
| Dynamite .... | 16.588 | 12.532 | 5,636 | 13,128 | 47,884 |
| Total ...... | 129,455 | 146,973 | 69,445 | 153,044 | 498,917 |

Estimated Number of Shots Fired.

| | Electric. | Fuse igniter. | Lamp. | Other fuse. | Total. |
|---|---|---|---|---|---|
| Crow's Nest Pass | 13,125 | 46,499 | 32,148 | 4,238 | 96,010 |
| Lethbridge .... | 12,456 | 9,250 | 12,000 | 98,009 | 131,715 |
| Calgary ...... | 18,850 | 10,800 | 5,000 | 29,917 | 64,567 |
| Edmonton ..... | 5.464 | 4,143 | 6,514 | 91,597 | 107,718 |
| Total ....... | 49,895 | 70,692 | 55,662 | 223,761 | 400,010 |

Number of Miss-Fire Shots Recorded.

| District. | By Electricity. | By Fuse. | Total. |
|---|---|---|---|
| Crow's Nest Pass ...... | 66 | 517 | 583 |
| Lethbridge ... ......... | 177 | 268 | 445 |
| Calgary ............ | 80 | 183 | 263 |
| Edmonton ............ | .. | 326 | 326 |
| Total ............. | 323 | 1,294 | 1,617 |

No statisties are available as to the causes of the miss-fires.

# WORK OF THE MINES BRANCH OF THE DEPARTMENT OF MINES, OTTAWA, DURING THE YEAR 1912

(Written for the Canadian Mining Journal.)

The official Summary Report reviewing the work of the Mines Branch for the calendar year 1912 is, at the present time, in course of preparation. Meanwhile, the following resume of the work undertaken during the past year may be of immediate interest.

The functions of the Mines Branch consist not only in the compilation and publication of statistical data relative to the mineral industry of Canada, but in inviting the attention of foreign, as well as local, capital to the great possibilities presented by the development of our mines, our quarries and other mineral resources. The purpose is, in a word, to aid in every possible, legitimate manner, the development of our mineral deposits.

The official programme of the work of the Mines Branch for the past year was, to a considerable extent, a continuation of work previously begun. Such a condition is but natural when the wide extent of the field to be covered is taken into consideration. Thus, for example, investigations dealing with wide spread branches of the mining industry, such as the winning of building and ornamental stones, and the development of the iron, copper and gypsum deposits of the Dominion, are all matters of very considerable magnitude. At the same time the work of the past year has also been marked by the inception of certain new investigations.

**Investigations of Iron Ore Deposits.**—The systematic investigation of the iron ore deposits of Canada carried on during the last seven years by the Mines Branch was continued during 1912 by Mr. E. Lindeman, assisted by Mr. A. H. A. Robinson, Mr. W. M. Morrison and

Mr. W. H. Davies. A detailed examination was made of the iron ore deposits in the vicinity of Sellwood, Ontario. This investigation included a study of the geological features of the iron ore deposits, the taking of representative samples of the ores, and the making of topographic and magnetometric surveys of the iron ore range. The results of this investigation will be published in bulletin form at an early date.

**Division of Chemistry.**—Mr. F. G. Wait, Chief of the Chemical Division, reports that the laboratories have been working up to their fullest capacity during the year. Considerable progress has been made in the construction and fitting of the new laboratories in the remodelled office building on Sussex Street. It is hoped that these new and much more commodious quarters will be ready for occupancy early in the coming year. The working strength of the staff of chemists has been increased by the appointment of Mr. N. L. Turner, lately of the Bureau of Mines for Ontario, who comes to the Mines Branch with experience in other fields and in the same character of work as he will be called upon to carry on here.

**Division of Mineral Resources and Statistics.**—The annual collection of statistics of the mineral production of Canada was undertaken by the Division of Mineral Resources and Statistics under the direction of Mr. John McLeish, and a preliminary report of the mineral production for 1911 was issued on March 5th, 1912. Subsequently the final report was sent to press, the following advance chapters being also issued as separate bulletins: "A General Summary of the Mineral Production of Canada during 1911;" "The Production of Copper, Lead, Nickel, Silver, Zinc and other Metals;" "Iron and Steel;" "Coal and Coke," and "Cement, Lime, Clay-Products, Stone and Other Structural Materials."

This division is now engaged in the preparation of statistics of production for the calendar year 1912, in the carrying out of which work the active co-operation of all operators is earnestly requested.

The calendar year 1911 showed a decrease in the total value of the mineral production from that of 1910, but exceeded all other previous years. Although as yet it is too early to forecast the probable production for 1912, it appears probable that this will equal, if not exceed, that for 1910. This is especially so in view of the great advance that took place in the price of metals early in the year. Probably the most important event of the year was the advent of the Porcupine Camp as an active gold producer.

During November, Mr. C. T. Cartwright spent some time in Eastern Ontario and in Quebec, gathering information in connection with the work of the Statistics Division.

**Division of Metalliferous Deposits.**—Dr. A. W. G. Wilson was occupied during nearly the whole of the first half of the year in writing and revising his report on Pyrites and Its Uses. This report is now in press and it is hoped that it will be ready for distribution about the end of January. On the completion of the Pyrites report, he resumed work on the report on the Copper Mining and Smelting Industries of Canada. The mass of material now available for this report has made it necessary to divide it into two sections which will be issued separately—one dealing with the mining end of the industry, the other with the smelting end. Towards the close of the year, Dr. Wilson spent about two months in the field for the purpose of revising the descriptive sections of these reports and bringing them up to date.

**Division of Non-Metalliferous Deposits.**—Mr. Frechette was engaged in collecting data from manufacturers throughout Canada concerning the minerals and mineral products used by them, special attention being given to the quantity, quality and source of present supply. The ultimate object of this investigation is to encourage the use of Canadian minerals by pointing out to the producers the requirements of the market and also the form in which the minerals should be prepared to best meet the needs of the various industries in which they are employed.

The work involved by the above investigation was commenced in 1911, during which year the required information was secured in the Provinces of Ontario and Quebec. During 1912 the scope of the enquiry was extended so as to include the remaining provinces of the Dominion.

Mr. Hugh S. de Schmid was, during the field season of 1912, engaged in a further investigation of the phosphate and feldspar deposits of the Dominion. The information thus acquired will be incorporated in a monograph upon these minerals which will be published by the Mines Branch in due course.

The districts visited included Parry Sound, where a mill has recently been erected for the purpose of grinding feldspar; Frontenac and Lanark Counties in Ontario, and the Lievre phosphate district in the Province of Quebec. The feldspar deposit situated in Manicouagan Bay on the lower St. Lawrence was also examined, as well as the mica-bearing permatites on Pied des Monts and Bergeronnes.

Mr. L. Heber Cole was, during the first seven months of the year, engaged in the compilation of data previously gathered in connection with his investigation of the gypsum and salt industries of Canada. Early in August Mr. Cole left Ottawa in order to complete his examination of certain deposits of gypsum in Manitoba and in Nova Scotia. The information obtained during the past two seasons will appear in the form of a revised edition of the monograph on Gypsum, issued by the Mines Branch in 1910.

**Ore Dressing and Metallurgical Division.**—During the first part of the year, the testing laboratory was operated for the experimental magnetic separation of ores received from Seven Islands Bay, Que., and from Bessemer and Childs mines in Ontario. A small sample of ore from Carter, West Virginia, which was submitted by Mr. J. W. Evans, Belleville, Ontario, was also tested in a similar manner.

Mr. George C. Mackenzie, Chief of the Division, devoted the entire field season to a detailed examination of the deposits of magnetic iron sands which occur at Natashkwan on the lower St. Lawrence. In carrying out this work, Mr. Mackenzie made use of an Empire drill and equipment. Mr. Ransom, Assistant Engineer, was, during this time, occupied in dismantling the old testing laboratory and in preparing plans for the new laboratory now nearing completion.

During the past fall the installation of machinery for the new testing laboratory was commenced. This new installation, occupying a building 75 x 50 feet, will, when completed, include the necessary equipment for experimental ore dressing either on a large or on a small scale. It will also have sufficient operative elasticity to permit of the investigation of the majority of problems encountered in dressing Canadian ores. For information concerning conditions under which such tests are undertaken, application should be made to Dr. Eugene Haanel, Director of Mines.

**Fuels and Fuel-Testing Division.**—The staff carrying on the investigations at the fuel-testing station has remained unchanged during the past year. Mr. B. F. Haanel is chief of the division; Mr. J. Blizzard, technical engineer; Mr. E. Stansfield, engineering chemist, and Mr. A. W. Mantle, mechanic.

During the earlier part of the year, the testing of peat fuel in the Korting gas producer was continued, special attention being given to the elimination of the tar fog found in the raw gas. A tar separator, designed by Mr. B. F. Haanel, was finally introduced and has given admirable results. A trial run was also conducted, using a Saskatchewan lignite in the Westinghouse, double zone, suction producer. The same producer, using peat fuel, also gave entirely satisfactory results.

During the fall, the results of certain investigations conducted by this Division appeared in the form of a report prepared by Mr. B. F. Haanel and entitled, "The Utilization of Peat Fuel for the Production of Power."

During the latter part of the year, the testing work of the Division was suspended, owing to necessary alterations to the present building and to the fact that an addition is being added to the fuel-testing plant. This addition was necessitated chiefly through the increasing requirements of the ore concentrating laboratory, but the increased accommodation will also add greatly to the efficiency of the work of the Fuel-Testing Division. Suitable accommodation is also being provided for the chemist of the Division, while a machine shop and adequate storage is also being arranged for. The space previously occupied by the ore concentrating equipment is now available for the installation of a steam boiler for testing purposes.

During the year, Mr. B. F. Haanel investigated conditions affecting power production in the west, and also presented scientific papers before the annual meeting of the American Peat Society and before the Eighth International Congress of Applied Chemistry. Mr. Haanel and Mr. Blizzard are at present in Europe, investigating peat and other power gas-producers, including both the non-recovery and the by-product recovery type.

In addition to the chemical work involved by the various tests, Mr. Stansfield, as a member of a committee of the International Congress of Applied Chemistry, has also carried out a research determination of the moisture of peat tar. He has designed and constructed an electrically heated tar still and has designed the complete equipment of the new chemical laboratories now nearing completion.

In accordance with the policy of further extending the scope of the work of the Fuel-Testing Division, Mr. J. G. S. Hudson visited the coal producing centres of the Provinces of Alberta and Saskatchewan. As a consequence, arrangements were completed whereby large and representative samples of lignites and of semi-bituminous coals are being forwarded to the fuel testing station at Ottawa. The value of these various samples, and their adaptability for use in the gas producer, will be thoroughly investigated by experimental tests conducted on a commercial basis. In addition to these commercial samples, a large number of smaller samples, representing full sections of representative seams, were collected and will be analyzed in the laboratory of the Fuel-Testing Division.

Considerable data were also gathered at the various mines visited, and included sections by measurement of the coal seams, notes relative to the character of roof and pavement, impurities of clay and shale contained in the seams, etc.

In choosing those coal mines from which samples should be taken, due consideration was given to such conditions as accessibility to markets, railroad facilities, and possible power requirements.

In addition, much information of a more general nature was gathered, including present consumption of coal for power purposes, list of existing power plants, present cost of developing power and mileage, and freight rates.

The carrying out of this work involved a personal inspection of all the larger coal mines in Saskatchewan, Alberta and British Columbia.

The possible future of peat as an asset of economic value to the Dominion, has, for several years, in the laboratory as well as in the field, been the subject of systematic investigation by the Mines Branch. The close of 1911 marked, however, the successful termination of this experimental work. Thereupon, a company, organized by Mr. J. M. Shuttleworth, of Brantford, Ont., petitioned the Government for permission to install at their own cost on the Government peat bog at Alfred a plant, in which the partial hand labour of the appliances used in our experimental plant would be replaced by machinery and power. This installation has now been completed, and, as a result, it is anticipated that the production of peat fuel on a commercial scale will be commenced in 1913.

During the field season of 1912, Mr. A. Anrep devoted his time wholly to a study of certain of the more important of the peat bogs situated in the Province of Quebec. The report on this work, which will be fully illustrated by maps and diagrams, is now being prepared for the press.

**Explosives Division.**—The Explosives Bill formulated by the Mines Branch in collaboration with the Justice Department, and which has for its object the regulation of the manufacture, importation and testing of explosives in Canada, was not reintroduced before the House of Commons during the session of 1911-12. The work of completing plans for the various building and equipment of the proposed explosives station at Ottawa was, however, continued. In furnishing detailed plans of the explosives testing station recently erected at Rotherham in Yorkshire, the Explosives Department of the Home Office of Great Britain has assisted very materially.

**Special Investigations: Building and Ornamental Stones of Canada.**—Professor W. A. Parks, of the University of Toronto, has continued his examination of the building and ornamental stones of Canada. This detailed investigation has, during the field season of 1912, been confined to the Province of Quebec. The results of this work will furnish not only descriptions of the different varieties of stone produced in the various localities, but also references to transportation facilities, and other conditions affecting production. There are, in various parts of Eastern Canada, a considerable number of quarries which were at one time large shippers, but which, owing to various causes, are at present lying idle. Professor Parks has, therefore, given special attention to a study of those circumstances which have adversely affected the stone working industry.

It is the intention of this Department to include in the present investigation all the Provinces of the Dominion, the data so gathered to constitute a monograph on the building and ornamental stones of Canada. It is, moreover, anticipated that this work will prove of special value to builders, contractors, and others, by indicating those localities in which each particular variety of stone may be most readily obtained.

Volume I. of this report has already been issued, and contains a systematic description of the building and ornamental stones occurring in that part of Ontario lying south of the Ottawa and French Rivers.

**Petroleum and Natural Gas Resources of Canada: Mr. F. G. Clapp and Mr. L. G. Huntley.**—During a part of the field season of 1912, Mr. Frederick G. Clapp, assisted by Mr. L. G. Huntley, was engaged in the preparation of a report on the petroleum and natural gas resources of the Dominion of Canada. This report will outline the history of developments, status of production, stratigraphy, drilling methods, markets, methods of transportation, quality, utilization, and such other technical details as are necessary in exploiting these resources to best advantage. Such a report is necessary for an operator in one field who may wish to be informed regarding conditions or methods existing in some other field, and it is needed, furthermore, for a layman who may intend entering the petroleum or natural gas business or associated enterprises, and who may demand truthful information regarding conditions or methods in various parts of the Dominion.

**Investigation of Metallurgical Problems of Economic Importance.**—It is generally conceded that the phase of Mines Branch operations which may be described as original research work, constitutes one of the most important features of departmental activity. Questions, concerning the application of new methods of metallurgical treatment, and the discovery of new uses for our minerals themselves, are clearly of very real importance to the mining industry of the Dominion.

A single example of the practical results that may be anticipated from such research work, is presented in connection with the conditions which at present govern the marketing of Cobalt ores. In the past the smelters have refused to pay for the cobalt and nickel content, yet it would be surprising if cobalt could not be advantageously utilized in hte production of many valuable alloys. It is obvious that other instances of a similar nature might also be cited.

Having in view, therefore, practical considerations of far-reaching importance, such as the above, the Mines Branch in 1910 took steps to further extend the scope of its technical activity. As a result, Dr. H. T. Kalmus was appointed to undertake a series of investigations on behalf of the Mines Branch, at the Research Laboratories of the School of Mining at Kingston. The following investigations may be instanced as exemplifying the character of the work that is being undertaken. An experimental investigation of the metal cobalt and its alloys; a study and report on the present status of the cobalt industry; an investigation of nickel—copper—cobalt—alloys. Such results as have been obtained up to the present time, will be referred to in the Summary Report for 1912.

**Investigation of Processes for the Reduction of Refractory Zinc Ores.**—In a previous Summary Report, the attention of the Government was called to the desirability of instituting an enquiry into modern processes for the extraction of zinc from refractory ores. At that time ample evidence, which need not be stated here, was presented, establishing the undoubted benefit that such an investigation, if successful, would bring to the zinc mining industry of Canada, particularly in the Province of British Columbia. ,

Acting on this suggestion, a sum of money was voted by the Dominion Government in 1910 to be devoted to an investigation of processes for the reduction of refractory zinc ores; for making experiments and for any other purpose that may be deemed advisable for the promotion and manufacture in Canada of zinc and zinc products from Canadian ore.

During the greater part of 1911 and 1912, work in connection with this investigation has been conducted in the metallurgical laboratory of McGill University by a staff of metallurgists under the direction of Mr. W. R. Ingalls, of New York. While this work has not as yet developed a process that will be commercially applicable to the treatment of the zinc ores of Canada, the experiments have thrown much light upon the principles of furnace design. A report fully covering the results of the work of the past year will appear in the Summary Report for 1912.

**Investigation of the Quartz Deposits of the Klondike District.**—During the field season of 1912, Mr. T. A. MacLean was retained by the Mines Branch to undertake an economic investigation of the quartz deposits of the Klondike and adjoining districts in order to obtain a reliable estimate of the probable value of these deposits Quartz veins in this part of the Yukon are plentiful, though frequently small and non-persistent, and occasionally very encouraging results have been obtained. With rare exceptions, however, it is not known, even approximately, what average amounts of gold the deposits in the different localities contain.

In order, therefore, to determine the most efficient and economical methods of treatment for the various ores, a petition was, early in 1912, presented to the Dominion Government by the Yukon Miners' Association, asking that a testing mill and a thoroughly equipped laboratory be established at Dawson. The quartz to be treated is practically all free milling.

Prior, however, to taking an action regarding the establishment of a testing mill, and also in order to obtain a fair general idea as to the gold content of the quartz, it was decided first of all to systematically sample the more important of the known occurrences, and also to endeavour to ascertain their probable lateral and vertical extent. This work was accordingly taken up by Mr. MacLean, and the results of his investigation will appear in the forthcoming Summary Report.

It should further be noted that in addition to such work as is referred to above, nearly every technical officer of the staff has been more or less occupied during the past season in gathering data which will be incorporated in the revised edition of the mining and metallurgical industry, now in course of preparation.

**Draughting Division.**—The staff of the Division is at present composed of a chief officer, two map compilers and one mechanical draughtsman.

The work assigned to this Division consists principally in the preparing of magnetometric survey and geological maps, the drawing of original plans in connection with the various mechanical plants, and the construction and drawing of original maps and diagrams used to illustrate reports.

During the past year, owing to the increase of work in this Division, the staff was increased by an additional draughtsman.

The following is a list of maps, diagrams and miscellaneous drawings prepared during the calendar year

1912. The name of the officer for whom they were prepared will be found in the margin.

| | |
|---|---|
| Magnetometric maps | 12 |
| Maps (geological and topographical) | 46 |
| Diagrams | 65 |
| Miscellaneous, photos, etc. | 145 |

**Report Covering the Operations of the Dominion of Canada Assay Office, Vancouver, B.C., During the Year Ending December 31st, 1912.**—There were during the year 527 deposits of gold bullion, requiring 597 melts and 597 assays, including the assembling and remelting of the individual deposits after purchase into bars weighing about 1,000 troy ounces each, and the assaying of same. The net value of the gold and silver contained in deposits was $975,077.14.

In the Summary Report of the Mines Branch for 1911 attention was called to certain conditions which, up to the present time, have affected in an adverse manner the amount of bullion forwarded to the Dominion of Canada assay office at Vancouver. Suggested changes recently brought to the attention of this Department should, if adopted, add very considerably to the real value of this assay office.

# PERSONAL AND GENERAL

Mr. Wm. Blakemore, of Victoria, B.C., has submitted to the Government of the province his report on the Doukhobor people resident in Kootenay and Boundary districts, to enquire into whose alleged non-observance of some of the provincial laws, and other matters, he was some time since appointed a special commissioner.

Mr. L. A. Bonner, of Barkerville, Cariboo district, B.C., was recently in Victoria prior to taking another trip to England.

An announcement made recently in British Columbia newspapers follows: "Mr. and Mrs. James McGregor, of Vancouver, announce the engagement of their second daughter, Lucy, to Mr. Charles M. Campbell, head mining engineer of the Granby mines at Phoenix. The marriage will take place January 7th." Charles McKinnon Campbell, B.Sc., B.A. (Manitoba), graduated in mining engineering at McGill in 1902. He has been with the Granby Consolidated Mining, Smelting and Power Co. more than half of the ten years that have since passed. In May, 1908, he read at a meeting of the Western Branch of the Canadian Mining Institute, held at Rossland, B.C., a very instructive paper on "Granby Mining Methods" (see C.M.I. Journal, Vol. XI, 1908), and has since done other valuable work for that branch. On Mr. O. B. Smith, jr., being appointed general superintendent of all the Granby Company's miles, Mr. Campbell was promoted to the position of superintendent of the company's mines at Phoenix. The responsibility of his position and the onerous nature of his duties will be apparent when it is mentioned that in 1912 the output of those mines was between 1,200,000 and 1,300,000 tons of ore.

Mr. W. G. Clark, foreman at the Payne mine, Slocan, B.C., who last autumn was seriously injured by an explosion in the deep-level adit, the driving of which he was superintending, is now out of the hospital. The sight of one of his eyes has been saved, but he has lost the other eye. He will probably return to Sandon, Slocan, in January.

Mr. G. B. Dean, superintendent of the Silver Ridge mine, near Three Forks, B.C., has returned to the Slocan from a visit to Spokane, Washington, U.S.A.

Mr. T. M. Daulton, manager of the Placer Gold Mines Co., operating on Ruby creek, Atlin, B.C., is spending the winter in Seattle, Washington.

Mr. W. J. Elmendorf has returned to Victoria, B.C., from Glacier creek, Portland Canal mining division, whence he went to ascertain the progress being made in driving a long deep-level adit on the property of the Portland Canal Tunnels, Ltd., of which company he is general manager.

Mr. George E. Farish, of New York, has again been giving attention to mining property in Sheep Creek camp, Nelson mining division, B.C.

Mr. W. E. Finch, manager for the Finch syndicate, which is operating under option of purchase the Idaho-Alamo group and other mines in Slocan district, British Columbia, spent the Christmas season in Spokane, Washington, with his family.

Mr. Alexander Grant, formerly manager of the Marble Bay mine, near Van Anda, Texada island, B.C., has been enjoying a visit to San Diego, California.

Mr. John Hopp, whose operations in the vicinity of Barkerville are on the largest scale of all of those who are hydraulic-mining for placer-gold in Cariboo district, B.C., is in Seattle, Washington, for the winter months, after having experienced an unusually dry and short gravel-washing season in Cariboo.

Mr. P. F. Horton is manager of the H. B. mine, situated near Salmo, Nelson mining division, British Columbia. Several hundred tons of lead ore, much of it carbonate, was shipped from this property to Trail last year. It is hoped the H. B. will be developed into a payable mine, after further development work shall have been done.

Arthur L. Ware, well known in the Kentucky and Tennessee coal fields as an engineer and machinery agent, has accepted a position with the Roberts & Schaefer Co. (engineers and contractors, Chicago), and will represent them in this territory. This company has for many years designed and built complete coal mining plants, coal washing plants, coal briquetting plants, and coaling stations. For the present Mr. Ware will make his home in Jellico, Tennessee.

Mr. John Kirkup, for years gold commissioner for Trail Creek mining division, British Columbia, has been a resident of Rossland for nearly 18 years, having commenced his official duties as mining recorder and constable at that place in March, 1895. Later he was promoted to the office of provincial government agent and gold commissioner. Having applied lately for removal to coast, the government has arranged to transfer him to Alberni, Vancouver island, where he will be local government agent.

Mr. A. G. Larson, of Vancouver, B.C., went to Colorado to spend the Christmas holidays, and arranged to visit mining districts in that State and oMntana before returning to British Columbia.

Mr. Chester F. Lee, of Seattle, Washington, a mining engineer, known to many in British Columbia, as well as the Northwestern States, is occupying part of his time in editing the Pacific Mining Journal, the publication of which monthly was commenced in Seattle last summer.

Mr. F. Chas. Merry, of Ferguson, Lardeau, B.C., for several years in charge of the Silver Cup and Nettie L. groups of mines, owned by the Ferguson Mines, Ltd., continues to superintend the development of those properties. The Silver Cup's output in 1912 was about 350 tons of ore, averaging more than 100 ozs. of silver to the ton, and between 35 and 40 per cent. lead. The ore also had an appreciable gold content.

Mr. E. C. Musgrave, who was superintendent of the Tyee gold-copper mine, at Mt. Sicker, Vancouver island, B.C., during its days of substantial profit-earning, is again in Victoria, where he will remain for about six months before returning to Mexico to look after his important interests there.

Mr. E. Rammelmeyer, of Salt Lake City, Utah, has gone to Switzerland on a six months' holiday visit. In the days of considerable activity at the Emily Edith mine, in Four-Mile camp, near Silverton, Slocan lake, B.C., Mr. Rammelmeyer was manager for the British company then owning that property.

The provincial government have let a contract for the erection of a building at Nanaimo, British Columbia, for mine-rescue training purposes. Mr. J. D. Stewart has been appointed to take charge of that station and the mine-rescue apparatus there also owned by the government.

Mr. Luther Saville, formerly of Nanaimo, is now manager of the coal mine of the British Pacific Coal Company at Slate Chuck, on Graham island, of the Queen Charlotte group, British Columbia. He is the holder of a first-class certificate of competency under the British Columbia "Coal Mines Regulation Act, 1897." Mr. Alex. Faulds, who had been in charge, has returned to Vancouver.

Dr. G. L. Tanzer, formerly managing director of a company that operated under lease the Cornell and Copper Queen gold-copper mines, at the northern end of Texada island, B.C., has returned to Seattle, in which city in earlier years he had an assay office and chemical laboratory.

Among recent applicants for enrolment as members of the Canadian Mining Institute, was Mr. B. L. Thorne, of Hosmer, Crow's Nest Pass, B.C. Thorne is one of the Hosmer officials of the Coal Mines Branch of the Canadian Pacific Railway Department of Natural Resources, of which branch Mr. Lewis Stockett is general superintendent.

Mr. John Waldbeser, for several years directed the development of the Emerald, a lead property near Salmo, Nelson mining division. Eventually the Iron Mountain, Limited, was organized, with Mr. Waldbeser as manager, and this company continues to be the only one in that part of the division regularly shipping lead ore in considerable quantity to the Consolidated Mining and Smelting Co.'s smeltery at Trail, B.C. Its output for 1912 was approximately 1,700 tons of ore, containing about 1,300,000 lbs. of lead, and 2,200 ozs. of silver. Heavy roads and consequent bad hauling adversely affected shipment of ore during the last quarter of the year.

Mr. G. B. Webster, who for some time past has been associated with mining in Slocan district, British Columbia, recently left that province on a trip to Montreal and other places in Eastern Canada.

Mr. W. C. H. Wilson, of Greenwood, B.C., office manager there for the British Columbia Copper Co., has had two very anxious months in Spokane, Washington, where his wife has been very seriously ill during that period. At last accounts there was sufficient improvement in her condition to allow of her removal from the hospital.

Mr. G. M. Colvocaresses, 43 Exchange Place, New York, has recently examined mining properties in Eastern Ontario and in the Gowganda region.

Mr. W. F. Battersby, of the Dome mine, Porcupine, was in Toronto on the 9th and 10th inst.

Mr. H. B. Pickings, formerly Deputy Inspector of Mines for the Province of Nova Scotia, has opened an office in the Metropole Building, Halifax, N.S., where he will practice as a private mining engineer. Mr. Pickings has had long and valuable experience in all the mines of Nova Scotia, particularly in the metalliferous mines.

# SPECIAL CORRESPONDENCE

## COBALT AND SUBSIDIARY SILVER CAMPS.

**The Year's Output.**—So heavily did the Nipissing and the Buffalo ship in the last month of the past year that the original estimate of 30,000,000 ounces will probably be exceeded by half a million ounces. What this is worth depends entirely on whether the Domionion or the Provincial method of estimating is adopted. The Dominion takes the total production in ounces and multiplies by the average price of silver for the year. This gives over $18,500,000. The Provincial Government allows three cents an ounce for loss in smelting and freight and treatment charges, or, in fact, what the company receives back for the product. This gives about $17,800,000. According to the method of computation, this is either a million and a half or two million dollars more for the ore this year than last, notwithstanding the fact that less was produced. If it is said that the increased price in silver represented two-thirds of the wage bill of the Cobalt camp, it will be seen what a very substantial increase this is. Moreover, it is gained without any sacrifice whatever.

The situation leaves shareholders in a very happy position. 1911 was the record year for dividends, and yet 1912 Cobalt investors will get about $1,250,000 more in dividends declared and paid than the year before.

The record of the Cobalt camp is summarized in the following table:

| | |
|---|---|
| 1904 | $ 111,887 |
| 1905 | 1,360,503 |
| 1906 | 3,667,551 |
| 1907 | 6,155,391 |
| 1907 | 9,133,378 |
| 1909 | 12,461,576 |
| 1910 | 15,478,047 |
| 1911 | 15,949,019 |
| 1912 (est.) | 17,500,000 |
| Total | $81,817,352 |

Gross value in market approximately $87,000,000.

This year's dividends will total approximately $8,-500,000, which brings the total payments for the camp, including those regularly published, English corporations and close corporations, to about $42,000,000. The dividends to January 1, 1912, were about $33,500,000.

Less and less ore is being shipped. Twenty-six mines shipped 21,763 tons, a loss of 3,947 tons in comparison with 1911. The following table shows how the tonnage shipped has fallen down since 1910, in spite of the fact that the value of the output has increased:

| Year. | Tonnage. |
|---|---|
| 1904 | 158.55 |
| 1905 | 2,336.01 |
| 1906 | 5,836.59 |
| 1907 | 14,851.34 |
| 1908 | 25,405.35 |
| 1909 | 30,057.58 |
| 1910 | 34,710.29 |
| 1911 | 25,710.22 |
| | 160,829.02 |

It is very difficult to obtain bullion figures until some time after the expiration of year, or rather it is easy to get them but hard to total them accurately. It will be seen by the table appended that the bullion shipments this year are a million ounces more than the total of the two years wherein silver bars have been shipped and the value is more than a million dollars greater.

| | | |
|---|---|---|
| Total for 1910 | 945,702.94 | $501,815.33 |
| Total for 1911 | 3,772,920.00 | 2,012,428.95 |
| Total for 1912 | 5,634,298.00 | 3,365,679.00 |
| | $10,352,920.94 | $5,879,924.28 |

Concentration first superseded the shipment of crude ore to the smelter and the Butters method of smelting the ore as first established at the Nipissing has accelerated the decline. The coming year will see very small tonnage of crude ore shipped from the camp while mechanical concentration will no more than hold its own. Syanidation and concentration and syanidation at the Nipissing, Buffalo, and Dominion Reduction Company will eventually be the standard method of handling the Cobalt ores. The riddle has been solved, as is evidenced by the fact that the Cobalt plant at Copper Cliff, which for years secured the lion's share of the high grade ore is shutting down as soon as existing contracts are finished and a clean-up can be made. The mine managers and companies now know that every cent there is to be made out of the ore they are getting; they have, in fact, eliminated the middleman, who in this instance happens to be the smelters.

There has been a most healthy and decided revival of interest in the camp. It was not found possible to inveigle the public into the game again; but syndicates of men who had a good surplus of income over expenditure have taken up nearly all the old prospects and they are being worked to-day. As the history of mining camps go, the Bailey, Casey Cobalt, Cobalt Central, Drummond, Foster, Green Meehan, King Edward, Nancy Helen, Kerry, Silver Bar, Silver Leaf, and Silver Queen, were astral shapes which no medium was capable of materializing according to the best expert opinion in the camp. Just to observe what honest and economical development has accomplished this year it is instructive to notice that the Bailey has a high grade orebody which has already yielded twenty tone of 2,000-ouce ore, and shows every evidence of persistence. The Casey Cobalt will produce a million ounces, and has a million and a half ounces blocked out on one vein alone.

The Casey Cobalt has been a consistent shipper of concentrates in the last month of the year, and has already proved a profitable investment to the syndicate that purchased it from the old company.

The Drummond is now mining 25-ounce ore at a profit and sweetening it up with various streaks of high grade before this year not known to exist.

The old Kerry lease on Cart Lake (now the Seneca Superior) has opened up a vein which for 200 feet runs 4,000 ounces to the ton and has already produced 12 cars of ore, two of which were of high grade. This is practically the result of one year's work. If development continues in the same spirit for another twelve months there should be at least fully as much progress made. This is all gain; unsuspected treasure. Very few mine managers of the old dividend earning mines attempt to make more than the most tentative estimate of ore reserves. Those doing so have in the main found satisfactory results. The Coniagas, for instance, has mined over 14,000,000 ounces, repaid all its capital to shareholders, and still has 17,441,800 ounces in sight. Mr. R. P. Rogers prefers to allow 20 per cent. for possible overestimation and calls is 13,953,000 ounces.

The most significant fact in the Coniagas' annual report is that despite the fact that the mine produced last year 3,309,724 ounces, the company was able to report that "development of new orebodies during the year has exceeded the shipments by 1,400,000 ounces." The ore reserves were compiled as follows:

Ore reserves, October 31st, 1912, are estimated as follows:

| | Ozs. |
|---|---|
| 4,480 tons high grade ore at 3,000 ozs. | 13,440,000 |
| 108,740 tons mill rock at 20 ozs. | 2,174,800 |
| 37,800 tons broken rock on stulls in mine at 40 ozs. | 1,512,000 |
| 10,500 tons mill rock in surface dumps at 30 ozs. | 315,000 |
| Total | 17,441,800 |

Of the 30,500,000 ounces to be produced by the camp Nipissing contributed 4,700,000 ounces, or within a few thousand ounces of the total of last year. How the remainder of the principal mines performed can be seen from the following table:

| Mine. | Gross production. | Dividend requirements. |
|---|---|---|
| Nipissing | $2,850,000 | $1,800,000 |
| Coniagas | *2,183,000 | 1,440,000 |
| Crown Reserve | 1,700,000 | 1,080,000 |
| McKinley-Darragh | 1,900,000 | 898,000 |
| Buffalo | *1,351,150 | 320,000 |
| Cobalt Townsite | 1,119,207 | 400,000 |
| La Rose | 1,800,000 | 749,230 |
| aO'Brien | 797,500 | ........ |
| bT. & H. B. | 561,992 | ........ |
| Cobalt Lake | 580,000 | 310,000 |
| Kerr Lake | 1,086,044 | 600,000 |
| cTrethewey | 382,800 | ........ |
| Timiskaming | 746,832 | 300,000 |
| Beaver | 464,000 | 240,000 |

*Gross production, estimated at 58c. smelter settlements.

aClose corporation.

bPays 300 per cent. about every two months.

cNo regular quarterly; paid 10 per cent. in 1912.

The eleventh day success of the Cobalt Townsite and the Casey Cobalt in the London market has created some excitement there that might be prejudicial to the sane and sober interests of the camp. It is well known that English firms actually engaged in mining are extremely well posted on the possibilities of the silver camp; but the English public can be stampeded as in the rubber boom. Anything more detrimental to the good name of the mining industry than such a stampede initiated on three-color scheme prospectuses can scarcely be imagined. There are indications that the English public are to be thrown the bait, but it is very doubtful if the fish will rise.

## PORCUPINE, SWASTIKA AND OTHER GOLD AREAS.

In spite of the industrial dispute that cut a quarter of a million dollars from the production of the camp, Porcupine made good its promise of 1911, in the past year. There are still but two mines on a producing basis, but five or six other have made such good progress in ore reserves and development that it is almost certain that they will add something to the aggregate of the coming year.

Before the end of the present year it is probable that the following companies will either have mills built and producing, mills building or mills projected. The tonnage given is the maximum expected to be obtained during the year.

Daily Milling Capacity.

| | Tons. |
|---|---|
| Dome | 675 |
| Hollinger | 500 |
| *McEaneny | 50 |
| Vipond | 100 |
| *McIntyre | 150 |
| aJupiter | 50 |
| *Dome Lake | 50 |
| aThree Nations | 50 |
| aPearl Lake | 100 |
| aRea | 50 |

*Under construction.
aPlanned.

### HOLLINGER OUTLOOK.

The Hollinger Gold Mines Company is the only producing company in Porcupine that has opened its books to the public. The results they have obtained, therefore, are of the utmost value in estimating the future of the camp. Owing to the strike and the serious condition of disorganization it has caused it is probable that a normal month's work would equal the actual amount of progress made in November and December, but conceding them at two full months it is found that the Hollinger has made a profit of $763,385 in five months.

| | |
|---|---|
| Profit for five months | $763,385 |
| Dividends paid | 270,000 |

This cannot be accounted a bad record for the first six months of actual operation.

To make the profit of $550,000 up to the end of October, "20,444 tons of ore from development, partly made up of waste rock inadvertently included from drifting and sinking, have been milled and have shown an average value of $19.70 per ton, 5,777 tons of ore from stopes have been treated and have shown an average value of $37.89 per ton. The average value of all ore removed from the mine to date is $23.69 per ton, established by treating 26,221 tons in the original test mill and in the new mill."

The mill was expected to handle 300 tons per day. Actual operations have demonstrated that with forty stamps in operation 450 to 500 tons can be milled each day. Stamp capacity has been tested up to 12 tons, and the cyanide plant up to the equivalent of 600 tons per day. An extraction was made of 97 per cent. of $30 ore.

That was the position of affairs previous to the time when 300 men walked out and left Mr. P. A. Robbins to get along as best he could. In his last report, issued with the third dividend, he says that as far as this mine is concerned, the strike is "broken." Since the strike commenced a profit of $94,013 was made up to the end of the month. There is little doubt that upwards of $100,000 profit will be made in December bringing the total for the year up to approximately $860,000.

As to the future of the property, all the premises advanced in Mr. P. A. Robbins' report of last January have been justified. He then estimated a tonnage of 462,000, with gold contents of $10,230,000. There is now more than that blocked out above the 200-foot level. A mile and a half of underground workings on eight veins had been accomplished before the strike began, and there are 41 veins on the property that carry ore of payable width and values.

### DOME PROBABILITIES.

The Dome has not seen fit to publish any figures yet. There is no secret that the mill is running well and making an extraction of 98 per cent., nor that development work has revealed extraordinary ore reserves, but as to the margin of profits in the quartz and schist they are stoping down, nothing has as yet been given out. In the mile and a quarter of development at the 60 and 100-foot level eight years' ore has been blocked out; eight years' supply, that is, if the mill were not enlarged. Between March 23 and November 1st the mill treated 65,000 tons. At the end of the year another tube mill and slime press were being installed in order to raise the capacity of the mill to 459 tons per day. This is by no means the extent of the ore reserves. Under what is known as the Golden Stairways vein the diamond drills report an orebody 365 feet wide, going to a depth of at least a thousand feet. There is little doubt that the Dome will increase the capacity of their mill very soon; and it is more probable that forty stamps will be added than merely twenty.

### McINTYRE MILL.

The little McIntyre mill commenced to treat ore on the first of March, and by the first of November 11,200 tons had been put through. The returns have enabled the company to meet current operating and development expenses. The 300-foot level of the mine revealed an excellent body of ore, but the character of the ore had so changed from that milled from the upper levels that it was decided to build another mill, including cyanide treatment. This plant is designed to treat 150 tons per day, and should have almost been finished if the strike had not delayed operations.

### PLENAURUM AND JUPITER.

The Plenaurum and Jupiter were making most satisfactory progress when the strike interfered with operations. The Jupiter was planning a mill and there is little doubt that the construction of one will commence with the spring. On the Pienaurum a long drift connects the two shafts under Pearl Lake at the 200-foot level. It has intersected some eleven veins, many of which are very promising. On one of these a winze has been sunk some 60 or 70 feet, and it has demonstrated that there is little fear that the veins at the second level will not carry as good values as at the first. Until this second level is developed there will be no thought of a mill. When the strike had hindered work for some time on this property it was decided to allow the mine to stand idle until spring; rather than to be put to the expense and trouble of fighting the strike during the winter months.

### PEARL LAKE PROPOSES A MILL.

It has just been announced that the syndicate now working the Pearl Lake mine will build a twenty-stamp mill upon the property. This decision was reached when the orebody was cut at the 400-foot level. The year will not be very old before the Rea is working again. A syndicate of moneyed men, whom Mr. John Redington represents in the North country, will erect a mill to treat the ore that is already in sight on the two upper levels and a vigorous attempt will be made to discover further lenses of good ore in the vein at the 300 and 400-foot levels. Other quartz bodies carrying good veins exposed on the surface, but as yet not developed at all, will also be opened up.

### SCHUMACHER.

It is very probable, too, that something will be made of the Schumacher. Mr. Joe Houston has now taken charge of the development of that property. It has always been regarded as one of the best prospects of the camp, and Mr. Houston's reputation is enough to guarantee a vigorous and intelligent campaign of development.

### McEANENY DEVELOPMENTS.

The McEaneny of the Crown Reserve is probably in a better position to calculate ore reserves than any property in the camp, excluding the Dome and the Hollinger. Starting the year with most discouraging prospects, there is now actually in sight three-quarters of a million dollars on one vein. A ten-stamp mill is being erected and stamps should be ready to drop in the second or third month of the year. Five stamps will be installed now; five more later on.

### DOME LAKE PROGRESSES.

The most definite advance outside the Pearl Lake area has been at the Dome Lake mine, where a high grade orebody has been blocked out for several hundred feet above the 50-foot level. A ten-stamp mill is here being erected and should be in operation about the same time as the McEaneny.

### DAVIDSON NEWS.

The fate of the Davidson is unknown; but the shareholders of the Crown Chartered do not appear to be ready to save it from the wreakage of the company. It and the Hughes-Porcupine are the only two properties that have made an progress in that portion of Whitney township and North Tisdale in which they are situated, last year. The Porcupine Lake (Hunter) have erected a plant and buildings after a careful testing of their veins with a diamond drill.

### SWASTIKA.

There will be two mills at Swastika during the coming year, one at the Swastika and the other at the Lucky Cross. At the lower levels the underground development of the Swastika has been disappointing. Very interesting from any point of view is the development of the Tough claims, near Kirkland lake. The vein, which has been developed, averaged not more than five inches on the surface; at a depth of ten feet it had widened to fourteen inches, with occasional bulges. All this ore was remarkably high grade and two shipments that have been made ran approximately $400 to the ton.

## BRITISH COLUMBIA.

The review of "Mining in British Columbia in 1912," which has already been printed in The Canadian Mining Journal, will have shown its readers that mining in the Province is, generally, in a satisfactory condition, and that the outlook is considered to be more favourable than for some years past.

The close of the year has seen activity the rule in the mining camps of the Province. The only labour difficulty at the present is that at the collieries of the Canadian Collieries (Dunsmuir), Limited, with mines at Extension and Cumberland, both districts on Vancouver Island. It is thought this trouble will be quite overcome shortly, for already the company has a fairly large number of men at work in some of its coal mines, and is making a production of coal up to about 1,000 tons a day. In Kootenay district a Board of Conciliation and Investigation is about to commence to look into the position in regard to the demand of the miners for increased pay; meanwhile, though, there is not any interruption of operations at the mines affected —some 20 in number.

### IN AINSWORTH MINING DIVISION.

Mines in Ainsworth division that shipped ore during 1912 were as follows:

**Bluebell.**—The quantity of ore mined and milled during the second half of the year (the concentrator was not operated during the first half) was approximately 33,000 tons; concentrate shipped to Trail, more than 3,400 tons; metals recovered were, silver nearly 50,000 ounces, lead about 4,172,000 pounds. Development work done proved the continuance of the big orebody below the level of Kootenay Lake. A rise made from the lower level to the surface in 1912 gave the mine a new main shaft, which was equipped with head-frame, and double-drum hoist operated by compressed air. Sinking of the old shaft is again in progress, and as soon as possible new ground will be opened therefrom and connection be made with the new shaft. Additions to plant and equipment included a new crusher house with two Blake crushers in series, and a storage bin; Sullivan compressor with a capacity of about 1,500 cubic feet free air per minute; and minor changes in the concentrating plant.

**No. 1 Mine.**—This was operated by the Consolidated Company, which, up to the end of November, had received at its smeltery at Trail from this mine 524 tons of ore averaging about 96 ounces of silver to the ton and three per cent. lead.

**Silver Hoard and Hope.**—The former of these two is situated in the old Ainsworth camp; the latter is on Princess Creek and is worked by the Florence Mining Company. Particulars of the Silver Hoard eave have already been published in the Canadian Mining Journal; some 750 feet of development work was done on the property last year, and 202.4 tons (dry weight) of ore shipped, the metal contents of the ore having been 13,846 ounces of silver and 13,711 pounds of lead. In addition several hundred tons of lower-grade ore was set aside for treatment in the future. Of the Hope, little is known to the writer; in 1911 the Florence Mining Company undertook the work of driving a tunnel to gain a depth of 500 feet. In 1912 40 tons of ore was shipped to Trail; no information of work done has been received.

**Whitewater and Vicinity.**—Shippers were: The Whitewater mine, operated by J. L. Retallack & Company, about 1,100 tons of hand-picked ore, averaging about 75 ounces of silver to the ton and 35 per cent. lead; the Utica, stated to have shipped $50,000 worth of ore; and the Panama, from which 61 tons of high-grade ore was sent to Trail.

## NELSON MINING DIVISION.

Work is being continued at the Granite-Poorman gold mines, the Queen Victoria and Eureka copper mines, and the Molly Gibson and La France silver-lead mines, all situated in the northern part of this division. Of these, the Granite-Poorman group is having its ore milled, shipping to the Trail smeltery only the concentrate produced after the pulp has passed the amalgamating plates; the Queen Victoria shipped to the British Columbia Copper Company's works at Greenwood by the end of December about 1,000 tons of low-grade copper ore, that having been the output from the time production was commenced late in November, after this mine had been purchased by that company and work resumed at it; the Molly Gibson's output for the year was between 2,000 and 3,000 tons, much of it concentrate.

Concerning the Dundee, in Ymir camp—development work has been in almost continuous progress on this property for the past three years. The most important work done was that of driving a tunnel, starting from a point at the southwestern corner of the property, where recommended some years ago by Mr. Bernard MacDonald in his report, made after he had examined the Dundee. The main adit has been driven 1,851 feet, and there has been some later drifting to the extent of about 600 feet. In addition some 400 feet of diamond drilling has been done. By far the greater part of this work was cross-cutting in country rock, only the last 200 feet having been driving on the vein. In the course of the cross-cutting several showings of ore have been met with; these will be opened later. The present object is to continue the main drift until it shall be under the old shaft, which will involve driving nearly 500 feet farther. The drift is being advanced about 5 feet a day; when it shall be under the old shaft, raising will be undertaken and continued until connection shall be made with the old workings, which are down to a depth of 260 feet from the surface, and approximately 640 feet above the level of the long tunnel above-mentioned. This means that when the connection shall have been made, the mine will be opened to a depth of 900 feet from the surface.

No continuous bodies of ore have yet been found at the greater depth worked, but the vein is there, well defined and running on a similar course to that shown in the old shaft workings. The diamond-drill shows it to be about 40 feet in width between walls. Some bunches and small streaks of ore were lately encountered, and it is expected that an ore shoot of considerable size will soon be entered. The drift has latterly been chiefly in quartz, heavily mineralized with iron pyrites and having small quantities of galena and zinc and some intrusive rock. A water-driven compressor supplies air for operating the machine drills used in drifting. No other work is planned for the time being—just to continue development along similar lines to those now being followed.

Other mines in Ymir camp are being worked, and still others about Salmo and Erie, and in Sheep Creek camp, of which some information will be given in the early future. Of these, the Yankee Girl, near Ymir, the Emerald, near Salmo, the Second Relief and Arlington, at Erie and the Queen and Motherlode in Sheep Creek camp, are the chief producing mines in the southern part of Nelson division.

## ROSSLAND AND TRAIL.

While exact figures of production of Rossland mines are not yet available, it is known that the quantity of ore produced in 1912 in Trail Creek division, which includes Rossland camp, is approximately 240,000 tons, as compared with 254,000 tons in 1911. Information received to date makes it appear that the Centre Star group shipped 31,000 tons less ore in 1912, and that Le Roi No 2 Company's mines also show a decrease in quantity; on the other hand, Le Roi made a gain of about 25,000 tons. There must be some good reason for the decreases in output mentioned, since it is well known the Centre Star group has much ore in sight, for it was reported to shareholders in the Consolidated Mining and Smelting Company at the last annual meeting, held in October, that "our Rossland mines show an increase in the amount of ore developed, with, we believe, a higher average value." Le Roi No. 2 reported, for its fiscal year to September 30th last: "Beside the discoveries of numerous oreshoots in the better-known veins in the upper ground, the most important development is that of an orebody on the 1650 (Le Roi) level. This is the deepest ore known in our ground and is of good metal content, size and character, and augurs well for the future of this part of the property in depth. Development is in progress here."

The smaller shippers in Rossland camp did not as a whole come up to expectations in the matter of output, since together they made a decrease in quantity. However, the outlook for some of them—the Blue Bird and Phoenix particularly—is decidedly promising, in both cases much better than at the close of 1911.

The Inland Empire, situated in an outlying part of the division, in the mountains westward from Rossland camp, completed the installation of its 10-stamp mill and commenced crushing ore late in the year. While production was small, it is an advance to have got to the producing stage, especially as it is expected an output will be regularly maintained. The mine has been developed to a depth of 300 feet, and levels have been opened at 70, 140, 200 and 300 feet respectively. The ore is of such a character that the saving of gold on the amalgamating plates is light, most of the value being recovered in concentrate, which is smelted at Trail.

# STATISTICS AND RETURNS

## COBALT ORE SHIPMENTS

The ore shipments for the week and year to date are as follows in tons:

| | Week Dec. 27 | Year to date |
|---|---|---|
| Bailey | 20.00 | 41.57 |
| Beaver | ...... | 163.75 |
| Casey Cobalt | ...... | 255.15 |
| City of Cobalt | ...... | 914.99 |
| Buffalo | 59.70 | 1,163.54 |
| Cobalt Lake | 30.10 | 1,056.51 |
| Cobalt Townsite | 67.76 | 1,867.78 |
| Chambers-Ferland | ...... | 500.93 |
| Coniagas | ...... | 1,997.90 |
| Crown Reserve | 19.99 | 457.83 |
| Drummond | 30.07 | 449.84 |
| Hudson Bay | ...... | 662.85 |
| Kerr Lake | ...... | 743.05 |
| La Rose | 106.26 | 3,538.93 |
| Lost and Found | ...... | 27.80 |
| McKinley-Darraugh | ...... | 2,509.16 |
| Nipissing | 27.86 | 1,803.62 |
| Penn. Canadian | ...... | 97.90 |
| O'Brien | ...... | 411.43 |
| Provincial | ...... | 22.22 |
| Right of Way | ...... | 242.82 |
| Temiskaming | ...... | 958.66 |
| Trethewey | 27.01 | 577.05 |
| Wettlaufer | 50.00 | 487.21 |
| Colonial | 13.33 | 76.47 |
| Dom. Red. Co. | ...... | 119.41 |
| Peterson Lake Seneca Superior). | 41.16 | 391.75 |
| Hargraves | ...... | 47.35 |
| Silver Queen | ...... | 31.25 |
| Totals | 534.24 | 32,171.24 |

The bullion shipments of the week were the following:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 54,464.00 | $36,756.00 |
| O'Brien | 15,736.00 | 9,722.00 |
| Buffalo | 10,550.00 | 6,600.00 |
| Miller Lake-O'Brien | 946.00 | 788.00 |
| | 85,696.00 | $58,866.00 |

## B. C. ORE SHIPMENTS

Exceeding the previous week ending December 28th, 1912, production by over 4,00 0tons, the production of the mines in the Boundary district last week was 44,931 tons and brought the total for the year over the 2,000,000 ton mark for the first time in the history of the district.

**Consolidated Company's Receipts.**

| | Week. | Year. |
|---|---|---|
| Sullivan | 1,073 | 31,061 |
| Emerald | 68 | 1,614 |
| Standard | 307 | 9,212 |
| Utica | 22 | 960 |
| Ferguson | 27 | 311 |
| Knob Hill | 100 | 2,248 |
| Queen | 40 | 683 |
| Centre Star | 3,702 | 157,571 |
| Le Roi No 2 | 265 | 25,100 |
| Le Roi | 1,669 | 45,581 |
| Whitewater | 29 | 1,088 |
| United Copper | 59 | 1,743 |
| Yankee Girl | 38 | 625 |
| Ben Hur | 106 | 975 |
| Hudson Bay | 80 | 879 |
| Bluebell | 160 | 3,571 |
| Idaho-Alamo | 40 | 88 |
| Other mines | .... | 27,591 |
| Total | 7,785 | 319,901 |

**Granby Smelter Receipts.**

| | | |
|---|---|---|
| Granby | 28,234 | 1,261,034 |

**B. C. Copper Company's Receipts.**

| | | |
|---|---|---|
| Total | 14,582 | 671,472 |

**Nelson.**

| | | |
|---|---|---|
| Total | 2,205 | 74,777 |

**Boundary.**

| | | |
|---|---|---|
| Granby | 28,234 | 1,261,034 |
| Mother Lode | 7,912 | 370,303 |
| Rawhide | 6,002 | 256,381 |
| Napoleon | 668 | 14,373 |
| Knob Hill | 100 | 2,248 |
| United Copper | 59 | 1,743 |
| Ben Hur | 106 | 975 |
| Nickel Plate, milled | 1,500 | 75,100 |
| Jewel, milled | 200 | 4,000 |
| Other mines | .... | 30,425 |

**Lardau.**

| | | |
|---|---|---|
| Ferguson | 27 | 311 |
| Other mines | .... | 58 |

**East Kootenay.**

| | | |
|---|---|---|
| Monarch, milled | 425 | 13,350 |
| Sullivan | 1,073 | 31,061 |
| Other mines | .... | 2,313 |
| Total | 1,098 | 46,724 |

**Slocan and Ainsworth.**

| | | |
|---|---|---|
| Standard, milled | 400 | 17,800 |
| Van Roi, milled | 1,100 | 58,000 |
| Bluebell, milled | 1,200 | 27,700 |
| Kilo, milled | 100 | 600 |
| Rambler-Cariboo, milled | 300 | 1,000 |
| Standard | 307 | 9,212 |
| Utica | 22 | 960 |
| Whitewater | 29 | 1,088 |
| Bluebell | 160 | 3,571 |
| Idaho-Alamo | 40 | 88 |
| Other mines | .... | 25,981 |
| Total | 3,658 | 148,000 |

**Rossland.**

| | | |
|---|---|---|
| Total | 6,026 | 241,257 |

**SILVER PRICES.**

| | New York cents. | London pence. |
|---|---|---|
| December 26 | $62\frac{1}{2}$ | |
| December 27 | $62\frac{5}{8}$ | $28\frac{7}{8}$ |
| December 28 | $62\frac{1}{2}$ | $28\frac{15}{16}$ |
| December 30 | $62\frac{1}{2}$ | $28\frac{15}{16}$ |
| December 31 | $62\frac{3}{4}$ | 29 |
| January 2 | $63\frac{1}{2}$ | $29\frac{5}{16}$ |
| January 3 | $63\frac{3}{4}$ | $29\frac{5}{16}$ |
| January 4 | $63\frac{3}{8}$ | $29\frac{1}{4}$ |
| January 6 | $63\frac{5}{8}$ | $29\frac{5}{16}$ |
| January 7 | $63\frac{3}{4}$ | $29\frac{3}{8}$ |
| January 8 | $63\frac{3}{4}$ | $29\frac{3}{8}$ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.



## ASSAYERS, CHEMISTS AND ORE TESTERS.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

**CANADA**

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.
1218. Summary Report of the Geological Survey for 1911.

**NEW BRUNSWICK and NOVA SCOTIA**

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

**QUEBEC**

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

**ONTARIO**

1213. Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

**NORTH WEST PROVINCES**

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.
1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

**BRITISH COLUMBIA**

940. Report on Graham Island, B.C., by R. W. Ells. (Reprint.)
1121. Memoir No. 13. Southern Vancouver Island, by Charles H. Clapp.
1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

**YUKON and NORTH WEST TERRITORIES**

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

### MAPS RECENTLY ISSUED:

**CANADA**

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

**NOVA SCOTIA**

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

**NEW BRUNSWICK**

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmorland Counties, N.B. Geology and topography. Scale 1 mile to 1 inch.

**QUEBEC**

1112. Map 12A. Vicinity of the Tranco ntinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.
1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

**ONTARIO**

964. Geological map of portions of the districts of Algoma and Thunder Bay, Ontario. Scale 8 miles to 1 inch. Second edition.

**ALBERTA**

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

**BRITISH COLUMBIA**

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.
1167. Map 29A. Mother Lode and Sunset Mines, Deadwood, B.C., Topographical. Scale 400 feet to 1 inch.
1147. Map 19A. Lardeau, West Kootenay, B.C. Topographical scale 4 miles to 1 inch. Contour interval 500 feet.
1197. Map 47A. Law's Mining Camp near Tulameen, B.C. Geological. Scale 600 feet to 1 inch. Contour interval 50 feet.
1219. Map 54A, Nanaimo Coal Area, Vancouver Island, B.C. Scale $1\frac{1}{2}$ miles to 1 inch. Contour interval 100 feet.

**YUKON and NORTH WEST TERRITORIES**

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

# BUYERS AND SELLERS OF METALS

# PROVINCE OF QUEBEC

**Department of Colonization, Mines, and Fisheries**

***The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.***

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

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The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

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High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

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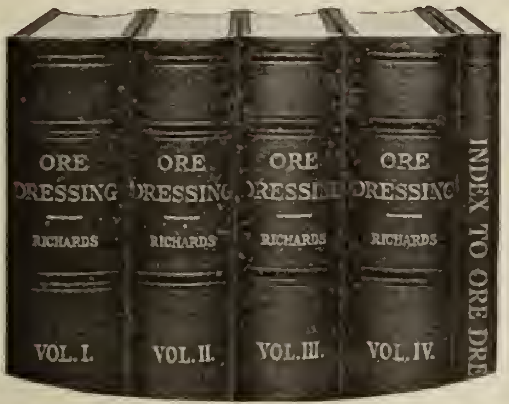


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Continued on page 36.

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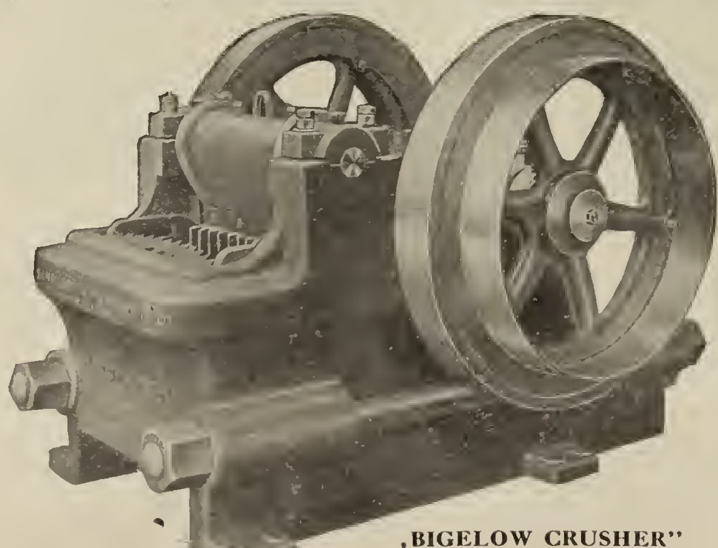


"BIGELOW CRUSHER"

# INDEX

# Canadian Mining Journal, Vol. 33

*JANUARY 1st 1912 TO DECEMBER 31st, 1912*

MINES PUBLISHING CO., LIMITED

10 Adelaide St. East

TORONTO

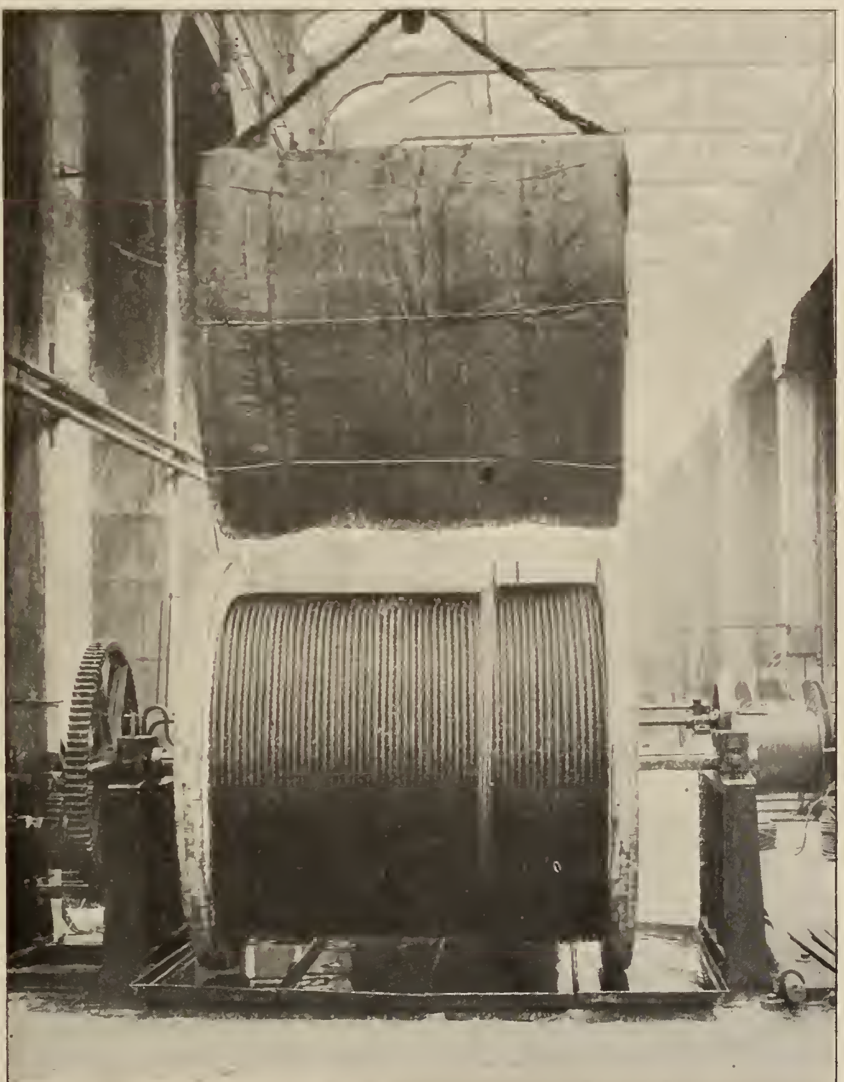
# INDEX

## CANADIAN MINING JOURNAL. VOL. 33

### JANUARY 1, 1912, TO DECEMBER 31, 1912



*Illustrated. E. Editorial.

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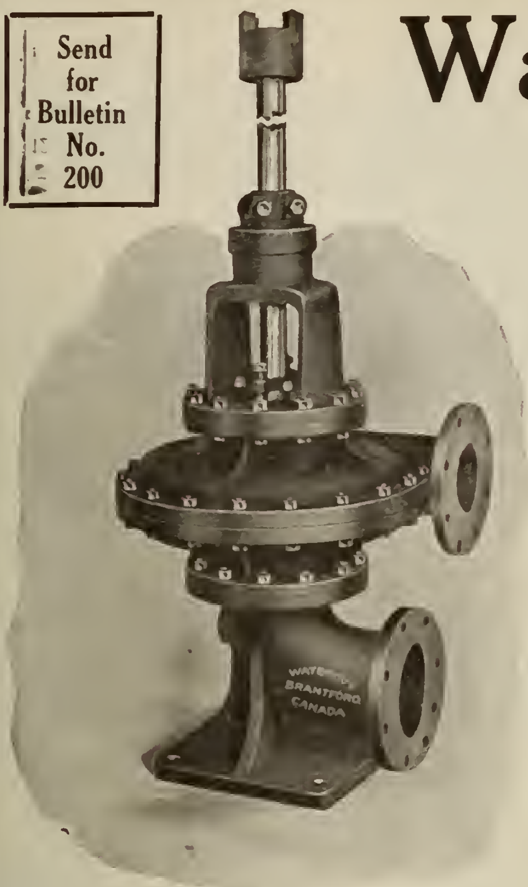
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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, February 1, 1913 No. 3

## The Canadian Mining Journal

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CONTENTS.



## INTERNATIONAL GEOLOGICAL CONGRESS

Most impressive are the preparations being made for the Canadian meeting of the International Geological Congress. A large amount of money has already been carefully and judiciously expended, and much more will have to be disbursed before the delegates reach Canada. Private citizens are giving their time, energy and money for the cause. Strong and representative committees have been organized. The Provinces of Nova Scotia, Quebec, Ontario, and British Columbia have contributed handsomely to the general fund. So, also, has the Dominion Government. And it is not to be believed that New Brunswick, Alberta, Manitoba, and Saskatchewan will allow this rare opportunity to pass without giving tangible evidence of their appreciation of its importance.

Let us for a moment glance over the history of the Congress, first, however, touching upon its character and objects. To quote from a pamphlet recently written by Mr. H. Mortimer-Lamb, "the objects of the Congress may be briefly summarized in the general statement that by means of the periodical meetings the results of knowledge acquired in any one country are given a universal application and significance. The Congress endeavours to provide, for example, for the adopting of uniform systems of mapping, nomenclature, and classification of rocks, fossils and minerals; and in other directions broadens the boundaries and extends the usefulness of geological science." Such tremendous undertakings as the completion of a geological map of Europe have been successfully carried through, and it is possible that a geological map of the world may be forthcoming within a few years. These, however, while they are the most striking, are not the most beneficent results that flow from the Congress. The intercourse of trained thinkers, the contact with new types, the personal comparison of notes, and the unexampled facilities for seeing extensive tracts of country that most of the delegates have not seen before, are profitable alike to the members of the Congress and to the country visited.

The membership of the Congress comprises professional geologists and persons engaged in other allied professions. There is, however, no hard and fast line drawn, although the official delegates are always representatives of corporate bodies. Nevertheless, many foreign visitors will, no doubt, come in their private capacities.

The first meeting of the Congress was held in France in 1878. Including this gathering there have been altogether eleven Congresses held at intervals of three years. The principal countries of Europe, the United States, and Mexico have been the scenes of action. For the first time Canada is now to be honoured.

The regular attendance has ranged between 140 and 703, and as many as thirty-six countries have been represented. It is estimated that the foreign contingent at the coming Congress will number at least 700, and may exceed this figure considerably. Of course, every local meeting, and every excursion will be attended by many Canadians. Thus it is possible that on such excursions as that to Cobalt and Porcupine the total attendance may run up to almost twice the first estimate.

The transportation companies have been so generous in their attitude towards the Congress, that no insuperable difficulty is expected in handling the excursions.

Fuller particulars of the coming International Geological Congress will be found on another page. The article is a transcript of a speech delivered by Mr. G. G. S. Lindsey before the Toronto Branch of the Canadian Mining Institute.

## NEWSPAPER JOURNALESE.

The following is from a Toronto newspaper:

> "They have dug up a Sourauphulous in Southern Alberta. As the intelligent animal had been buried several thousand years there was every excuse for its having gone sour in the meantime."

As the intelligent humourist of the newspaper in question has taken on himself the duty of revising paleontological orthography, and as he has not the excuse of having been buried "several thousand years," and as his joke is based upon a profound and complete misconception, and as it is quite as archaic as the innocent mispelled monster, we therefore find him guilty of something far removed from humour.

## MINE RESCUE WORK IN CANADA

The Commission of Conservation deserves commendation for its latest publication. For some time the subject has been before the public. The Commission has built up a strong system of publicity ,and it is well that the vital topic of mine rescue work should be given the benefit.

The pamphlet, "Mine Rescue Work in Canada," has been compiled by Mr. W. J. Dick, the mining engineer of the Commission. It covers, very briefly, a comparison of death rates in Canadian and foreign collieries, a description of apparatus, legal requirements abroad, Canadian establishments, and the general work of organization.

Although in other countries coal mine operators are compelled by law to instal rescue apparatus, in Canada, where authority for such legislation is vested in the Provincial Governments, the Province of British Columbia alone enforces their use. Nevertheless, owing entirely to private enterprise, Nova Scotian mine owners were first in this humane movement.

In addition to the four small stations equipped by the British Columbia Government, there are four privately-owned stations. Moreover, several companies are supplied with apparatus. In Alberta there are two, with a third under construction; and in Nova Scotia there are three exceedingly well equipped stations. Particulars of all these will be found elsewhere in this issue.

Whilst Canadian operators are following the lead of European mines, it is not out of order here to claim some credit for the Canadian Mining Journal. We were the first publication in Canada to advocate in any way the adoption of rescue apparatus and the subject has been repeatedly and emphatically referred to in these columns.

## UNITED STATES GEOLOGICAL SURVEY

The thirty-third annual report of the United States Geological Survey has just been issued. In reviewing therein the work of the department during the past year the director, Mr. George Otis Smith, takes occasion to emphasize a point that is not properly appreciated even by mining men, certainly not by the general public, namely, that scientific investigations are inseparable from economic work. "In any field," he remarks, "economic work of the highest rank is impossible without full knowledge of the scientific laws and principles pertaining to the subject of the work; but as there is no application of geology that does not involve unsolved problems, some of them of the highest importance, the best knowledge available is nevertheless relative. It thus follows that the broad and searching observations which should accompany every piece of good economic work comprehend data that are eventually combined in the construction of new scientific hypotheses, some of which, as more observations accumulate, grow into established laws or principles that are in turn of the greatest practical consequence. Thus the detailed studies of the metalliferous deposits in one region or another bring to light evidence from which to determine the genesis of the ores and the modes or conditions of their occurrence, and the economic inquiry becomes more intelligent and successful when once this new principle regarding the mode of an ore occurrence is understood." Mr. Smith gives as an interesting illustration of the deduction of a principle from data gradually accumulated from investigations in several fields, the conclusions presented in the paper by Mr. W. H. Emmons on the enrichment of sulphide ores; while an illustration of scientific results based on a long period of field studies, is found in the pre-Paleozoic history of Central North America, as described in the monograph by Van Hise and Leith on the geology of the Lake Superior region.

As indicating the broad-minded policy by which the affairs of the United States Geological Survey are governed, it may be noted that many of the scientific results of the survey's operations are frequently first published either in technical periodicals or in the transactions of scientific societies. The director explains in his annual report that this practice presents an opportunity for the free discussion of scientific theories and problems that otherwise would not be feasible.

## MARITIME PROVINCE IRON ORES

In our last issue we noticed editorially the excellent work that was done last year by the Nova Scotia Steel & Coal Company in its Wabana mines, Bell Island. Newfoundland. The Wabana ore. as our readers are doubtless aware, is shipped to the Scotia blast furnaces at North Sydney.

Encouraging as is the progress made by the above-mentioned company, it is even more encouraging to learn that the local iron mines of New Brunswick and Nova Scotia are to produce more ore during 1913 than ever before.

For various sufficient reasons, the Torbrook and Nictaux mines (Nova Scotia) belonging to the Canada Iron Corporation produced only 30,000 tons of washed ore. As a matter of fact, the washing plant was in commission for only two months. Its capacity is about 18,000 tons per month. It will run steadily throughout the current year. Already orders for 100,000 tons of washed ore have been booked, and there seems to be a ready market for the product, not only in Europe but in the United States.

The mines are being equipped for an output of 1,000 tons per day.*

Near Bathurst. New Brunswick, where are situated the other Maritime properties of the corporation, a similar washing plant has been erected. After the completion of the plant, 90,000 tons of washed ore were shipped, late in 1912, to United States ports. Orders for 1913 have been booked to the extent of 200,000 tons. Additional equipment will bring the plant's capacity up to 1,500 tons per day. Stripping by means of steam shovel will much facilitate this year's quarrying. Tide water docks at Newcastle are distant about seventeen miles.

The bold, though sound, development policy of the Canada Iron Corporation will enable it to place upon the market about 300,000 tons of high-grade non-phosphatic magnetite and, roughly, 200,000 tons of excellent phosphatic hematite and grey calciferous magnetite. This, of course, implies that the mines will live up to expectations. That they will do so appears assured.

This being the case, Nova Scotia and New Brunswick will immediately leap into the forefront of Canadian iron-ore producing provinces. But more than this will follow. No enterprises of this kind are successful without bringing in their train other new concerns, together with a general increase of the country's prosperity.

*(See special N. S. issue, Sept. 15, 1912, p. 637 et seq.)

## MINING AND RAILWAYS

Some very illuminating facts are contained in a recent Government blue book, the Annual Report of the Department of Railways and Canals for the fiscal year ending March 31, 1912. In a tabulated statement of the principal freight carried over the Intercolonial Railway, it is observable that the direct products of the mine supply almost 33 per cent. of all the freight handled. The commodities falling into this category are as follows: Coal and coke, ore, sand, stone, salt, slate and granite, and phosphate. Petroleum, all iron products, brick, lime, and cement come under the head of manufacturers. It is a notable fact that, even with this arbitrary classification, the products of mines furnish more than any other class of freight. Manufactures yielded about 31 per cent. of the total, as against the 33 per cent. mentioned above. Products of the forest, products of agriculture, and products of animals followed in the order indicated.

Tapping a region of immense mining possibilities, there is not the least room for doubting that the Intercolonial will depend more and more largely upon the products of the mine for any rapid growth in its freight traffic. The whole situation is worthy of study.

If this argument should be supposed to require further explication, it is only necessary to add that some of the largest items under the head of manufactures are the semi-finished or finished products of smelting and metallurgical establishments.

A thorough investigation of the situation would assuredly repay any reasonable expenditure.

## INTERMITTENT CYANIDATION

A short article published on another page deals with this timely subject. It is claimed by the author that intermittent cyanidation has not had fair consideration at the hands of metallurgists. It is pointed out that, theoretically at least, the advantages are in favour of intermittent as compared with continuous cyanidation. Continuous treatment is not ideal. The finer pulp is treated too long, the coarser, since its transit is too rapid, is not treated long enough.

These conditions are corrected by the simpler system of intermitten decantation, which provides proper agitation as a part of the process.

We hope that some of our readers will send in their opinions on this matter.

## EDITORIAL NOTES

The King Edward mine at Cobalt, as mentioned by our Northern Ontario correspondent, is showing symptoms of good ore. The King Edward is now being worked on a scale commensurate with probabilities. Formerly it was operated on florid hopes. The change is one of the benefits of the rational leasing system.

---

"Dios Nos Guie" is the motto over the entry to a well-known Mexican mine. Being translated, it signifies "God Guide Us." Whilst there is a touch of pathos in this prayerful legend, it is most eminently opposite. Appropriate to many a mine would be the rendering "God Help Us."

---

Canada now ranks seventh amongst the copper producing nations of the world. Last year its estimated production was 33,000 long tons. This slightly exceeded Germany's production, and was slightly less than that of Chili.

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It is announced that the Indian Geological Survey has discovered the accurrence of asbestos of excellent quality in Idar State. The mineral is said to be of the amphibole variety, some of the fibre being as long as 8 inches.

---

The report of the Council of the Canadian Mining Institute for the year 1912, printed elsewhere in this issue, is a satisfactory record of progress. It is gratifying to note the steady increase in membership, which now is in excess of a thousand. The accessions during the year of 170 members, associates and student members, constitute an increase of nearly 20 per cent. on the membership returns of 1911. There could be no better indication that the value of the work of the Institute is both recognized and appreciated by the mining men of the Dominion. By the establishment of a branch in Southern Alberta last autumn the Institute is now represented by local organizations in all the principal mineral producing provinces, with the exception only of Nova Scotia, where, however, it is least necessary. The meetings last year were distinctly successful from every point of view, and the volume of transactions, which we understand, will be distributed shortly, will contain many papers of quite exceptional interest and importance.

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A circular recently issued by the secretary of the Canadian Mining Institute contains the information that the next annual general meeting will be held in Ottawa. The provisional programme as published promises well. The subjects announced for discussion are for the most part of timely interest or have a practical significance. The meeting, we learn, is to be opened by H.R.H. the Governor-General, and the Rt. Hon. the Prime Minister has accepted an invitation to be the Instiute's guest of honour at the "annual dinner," at which he will speak.

## RESIGNS OFFICE OF PROVINCIAL ASSAYER.

With the close of 1912, Mr. Herbert Carmichael, of Victoria, ended a long period of service with the British Columbia Government, having resigned the office of Provincial Assayer so that he may give his time and attention wholly to his private interests.

On September 21st, 1891, Mr. Carmichael was appointed Government Analyst, and in the spring of the following year received the appointment of Provincial Assayer, the duties of both offices thus devolving upon him. At that time there was not an organized Department of Mines in the Province, nor any separate clerical staff to attend to the work connected with mining. The Provincial Secretary or another minister of the day acted as Minister of Mines, and his staff attended to whatever clerical work was requisite in that connection. The only technical advisers in respect of mining the Provincial Government then had were Mr. Archibald Dick, of Nanaimo, Inspector of Mines, and Mr. Carmichael, Provincial Assayer. From the time the Hon. John Robson, then Premier, was as well Minister of Mines, until the present there has been a very large expansion of the mining industry of the Province, and with it of necessity the organization and development of the Department of Mines

Prior to 1892 lode-mining was of very little importance in British Columbia, the total value of production up to that year, as on official record, having been less than \$300,000. The aggregate value to the end of 1912 is in excess of \$200,000,000, so that during his term of office Mr. Carmichael has seen the industry with which he has so long been officially identified make advances that, in so new a country, may fairly be described as tremendous. This is the aggregate value of lode minerals prodneed—not of all minerals—for the grand aggregate is now nearly \$330,000,000.

### An Interesting Incident.

As an interesting incident of by-gone years, it may be mentioned that one of the first lots of ore Mr. Carmichael had sent to him was some from Slocan district, forwarded by Mr. Frank Fletcher, long identified with Nelson. This was found to assay more than 3,000 oz. in silver to the ton, and notwithstanding that he got similar results from each test he made, the new Provincial Assayer signed the certificate with fear and trembling, for such rich galena ore until then had been unknown in British Columbia. To-day, and for many years, such an assay return, would cause no surprise. The banner year for work in the Assay Office was in 1897; there was nothing like it before, nor has there been since.

Mr. Carmichael, among many useful duties performed, was largely instrumental in getting the Bureau of Mines Act, 1895, passed, which Act he drafted. Under that Act, Mr. W. A. Carlyle was the same year appointed the first Provincial Mineralogist for British Columbia, and these two officials in January, 1896, began the organization of the Bureau of Mines. Early in 1898 Mr. Carlyle resigned, and was followed in the office of Provincial Mineralogist by the present occupant, Mr. Wm. Fleet Robertson, who took office on June 1st, 1898.

During many years of zealous performance of his official duties, Mr. Carmichael has made numerous friends throughout British Columbia, and these, while regretting that the Department of Mines is losing the efficient services of so good a chemist and so capable an officer, will wish him abundant success in his enterprises, several of which will hereafter fully occupy him.

# NOVA SCOTIA'S MINERAL PRODUCTION, YEAR ENDING SEPTEMBER 20th, 1912

Written for the Canadian Mining Journal
By H. B. Pickings.*

The year 1912 from a production standpoint has been for the mineral and allied industry of Nova Scotia a record year.

The coal production 6,800,000 tons was greater by half a million tons than the production of 1908 the previous record year. The large increase was due to a record production by the Dominion Coal Company and Nova Scotia Steel & Coal Co., in Cape Breton, and the resuming of operations at Springhill, when the Dominion Coal Company took over the mines of the Cumberland Railway and Coal Co. The Pictou County production was slightly less than in 1911, due to attention given by the Acadia Coal Co. to underground development and the changing of their power plant from steam to electricity, the electric power to be generated from coal at a central power station.

Since the closing of the Canada Iron Corporation mines at Torbrook in 1911 no iron ore has been mined in the Province. This company did, however, operate their concentrating plant, treating ore from their stock pile at Torbrook and they made a number of shipments. The iron-ore market has recovered from the low prices of 1911 and the Torbrook mines are being unwatered and will shortly be again in production.

The quantity of gypsum quarried was 350,000 tons, the greater quantity as in the past being from the quarries near Windsor, Hants Co. Extensive diamond drilling has been and is now being done on several of the gypsum deposits.

The gold production of 5,000 ounces falls far below the production of the previous year, and is many thousand ounces below the average yearly production of the Province, while the industry can not be said to be in a flourishing condition, the bullion produced does not do justice to the extent of the operations carried on, as at several districts serious attention was given to mine development and plant equipment, and no effort made to immediate production.

The production of 250 tons of manganese was all recovered from mine development by the Nova Scotia Manganese Co. at New Ross. This company directed all their efforts during the year to mine development, surface equipment and the construction of a road to tide water at the Avon River, the length of the road to be built being nine miles, of this seven miles has been completed. In the mine preparations have been made to commence stoping, and mining and shipping of ore will shortly be undertaken.

Shipments of tungsten concentrates totalling 15 tons were made from the property of the Scheelite Mines, Ltd., at Scheelite, Moose River, the concentrates being of particularly high grade, running over 72% tunstic acid. Development work has been continued at this property during the year.

The Barytes, Ltd., at Lake Ainslie commenced operating their new mill and produced 1,000 tons of manufactured barytes, shipments were made as far west as Winnipeg. No other barytes was mined.

The steel companies of the province, the Dominion Iron & Steel Co., and the Nova Scotia Steel & Coal Co. produced 415,000 tons of pig iron and 465,000 tons of steel ingots, both record productions. Limestone quarried for flux purposes was 550,000 tons.

The amount of coke made was 600,000 tons, an increase of 55,000 tons over the amount manufactured in 1911.

The output of the brick yards, 23,000,000, is about the same quantity as during the previous year. Several of the larger brick yards have been merged under the name of the Nova Scotia Clay Works, Limited, and preparations are being made greatly to increase outputs.

Building stone at 10,000 tons, drain pipe tile, etc., at 1,000,000 feet are about same as the production of 1911.

Other productions were moulding sands 1,200 tons, and sulphate of ammonia 5,200 tons.

Prospecting has been engaged in on iron, molybdenite, lead-silver, copper, oil-shale and other deposits, but while promising finds have in some cases resulted, no ore has been mined during the year.

The amount of iron ore imported into the province and reduced in the furnaces of the Dominion Iron & Steel Co., and the Nova Scotia Steel and Coal Co., was 880,000 tons.

The figures given above are all for the 12 months ended Sept. 30th, 1912, the fiscal year of the Nova Scotia Department of Mines ending on that date, and the figures for the calendar year therefore not being available at this writing, while some of the individual productions will for the calendar year vary slightly, but taken as a whole the production will be about the same.

# MINE RESCUE WORK IN CANADA*

By W. J. Dick.

In Canada as regulation of mines is a function of each province, the Federal Government has no authority to require operators in the several coal-mining provinces to make provision for mine-rescue aparatus. Neither has the Federal Government carried out any demonstration work in th use of such apparatus. Of the coal-producing provinces, British Columbia is the only one that requires rescue apparatus to be kept at coal mines.

The following is a short account, by provinces, of the nature and extent of mine-rescue work in Canada:—

### NOVA SCOTIA.

Ther are no government rescue stations in this province, nor is there any statutory provision for compulsory mine-rescue training and equipment at coal mines.

*Mining Engineer, Halifax, N.S.

*From Report of Commission of Conservation.

Nevertheless, a number of the most important mines have well equipped rescue stations and a large body of men trained in the use of breathing apparatus.

**Dominion Coal Company.***—The Dominion Coal Company, have in the past, suffered severe lsses through fire, both above and below ground. In 1903, a fire occurred in Dominion No. 1 mine, and, in 1906 a fire broke out in the pit bottom of the Hub colliery. In both cases, the mine had to be flooded before the fire could be extinguished. In order to guard aginst similar possible occurrences,, an efficient fire fighting organization and equipment were established. Only that portion of the equipment and organization which relates to breathing apparatus will be considered in this description.

In 1908, the Central Rescue station was constructed and equipped near No. 2 colilery. Its central position in relation to the surrounding mines, indicated it as the most desirable. When erected, this station was, with the exception of the United States Government station a Pittsburg, the only one of its kind on the North American continent. It is a substantial brick building with concrete floor, and contains four rooms, viz.: main or apparatus room, emergency hospital and dressing room, office and store-room.

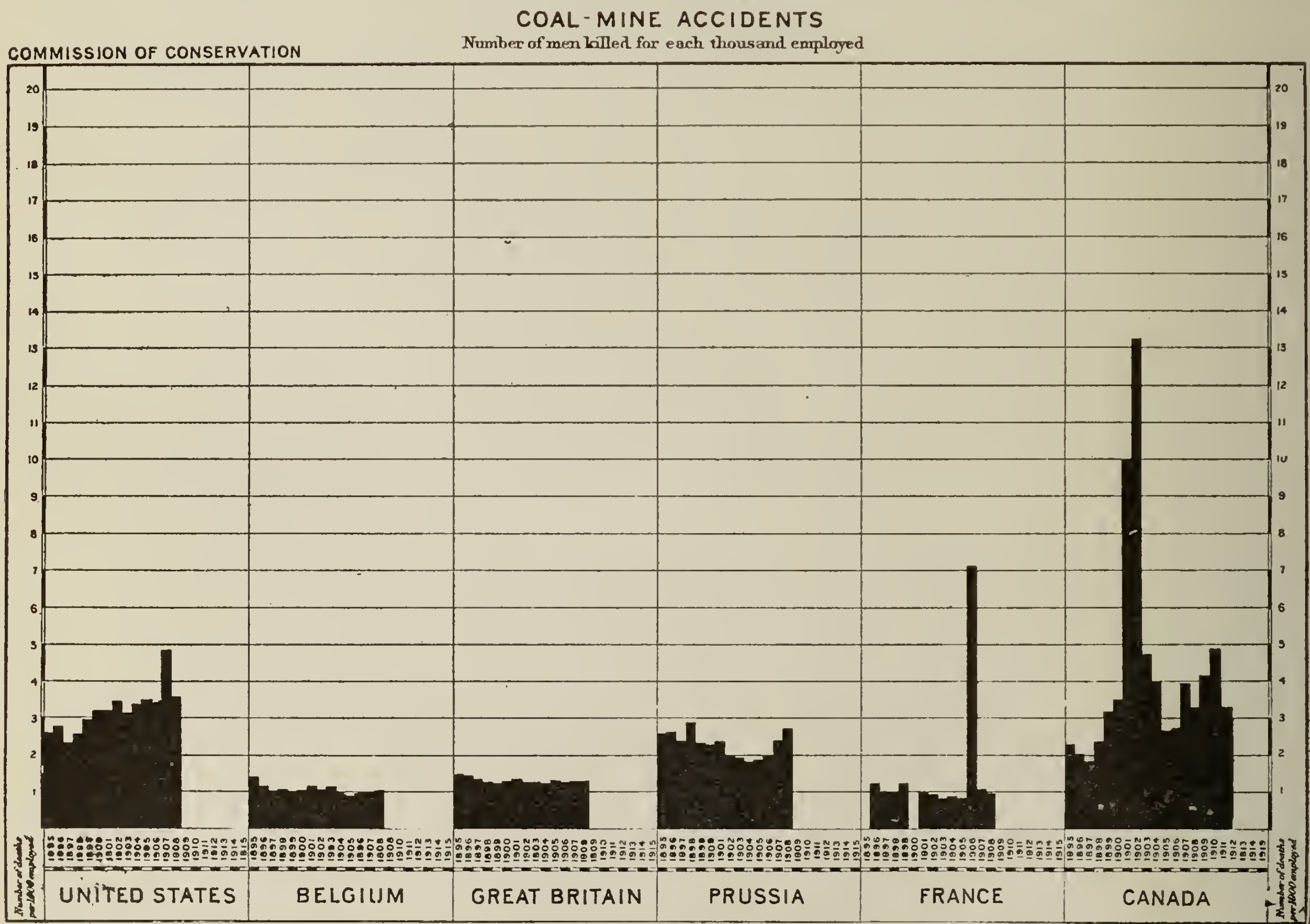
The equipment consists of thirty-six Draeger apparatus, forty-two electric hand-lamps, one Bratt resuscitating apparatus, one pulmotor, one electrically-driven oxygen-refill pump and one hand-power oxygen-refill pump, one Koenig smoke-helmet, one wheel stretcher with oxygen flask and mask complete for bringing injured men out of an irrespirable atmosphere, and a sufficient supply of oxygen and potash cartridges. The electric hand-lamps are charged at the station and kept always ready for use. The station is connected by telephone, with al the collieries and with the instructor's residence.

One end of the rescue station is fitted up as an emergency hospital and dressing room. It contains a wash-basin, spring couch, table and rubber sheet. First-aid requisites, blankets, stimulants, etc., are also kept on hand. In additon to the ordinary stock in the store-room, eight canaries are also kept available for the purpose of testing for carbon monoxide during mine-rescue work.

Adjoining the station is a smoke chamber where the men are trained to work in an irrespirable atmosphere This is a rough, wooden shed, consisting of an observation corridor divided from the main building by a partition with glass windows. The smoke chamber proper has no windows, and has a fire grate in one corner in which materials are burned to make a dense smoke. For exercising the men during trainig, there are two weight lifting machines, consisting of a rope passing over a pulley and attached to a 45 pound weight.

Men training in the use of breathing apparatus, enter the smoke room wearing the apparatus and carrying electric lamps. After performing a certain amount of work, each man is examined as to his behaviour under physical strain and his suitability for this class of work is thus determined.

In addition to the apparatus at the Central station, auxiliary apparatus are kept at some of the outlying collieries. These are intended for use by the colliery rescue corps pending the arrival, if necessary, of a detachment from the Central station.




*In this description of the mine-rescue equipment of the Dominion Coal Company, free reference has been made to the article on "The Fire Fighting Organization and Equipment" of these collieries, written by F. W. Gray, Assoc. M. Inst. M.E., and published in the Canadian Mining Journal.

Each colliery has either two or three rescue corps, consisting of men who are resident at the colliery and acquainted with the workings. These men are chosen because of their knowledge of the underground workings, ventilation and position of their knowledge of the air roads, pipe lines and connections. A necessary preliminary to their selection is that they must be passed upon by the instructor as being suitable for the work. The names of the men composing the corps and the period for which they are detailed for duty are posted in the firemen's hall, near the apparatus. As far as possible, the corps are arranged in such a way that the trained men at one colliery shall not all be underground at the same time.

The instructor makes periodical visits to all the collieries having rescue apparatus and exchanges the colliery apparatus for others from the Central station. This is done in order that the apparatus may always be in good working order.

The company intends, also, to install a sub-rescue station at New Waterford to serve the Lingan collieries. This equipment is to consist of ten Draeger apparatus with spare oxygen cylinders, one hand power oxygen refill pump and one pulmotor. It is also the intention of the company to install a rescue station at the Springhill collieries. It will consist of ten apparatus, one refill pump and one pulmotor together with the necessary oxygen tanks and accessories.

tached; ten electric hand lamps, one oxygen-refill pump, one Bratt resuscitating apparatus, and a sufficient supply of oxygen and absorption cartridges.

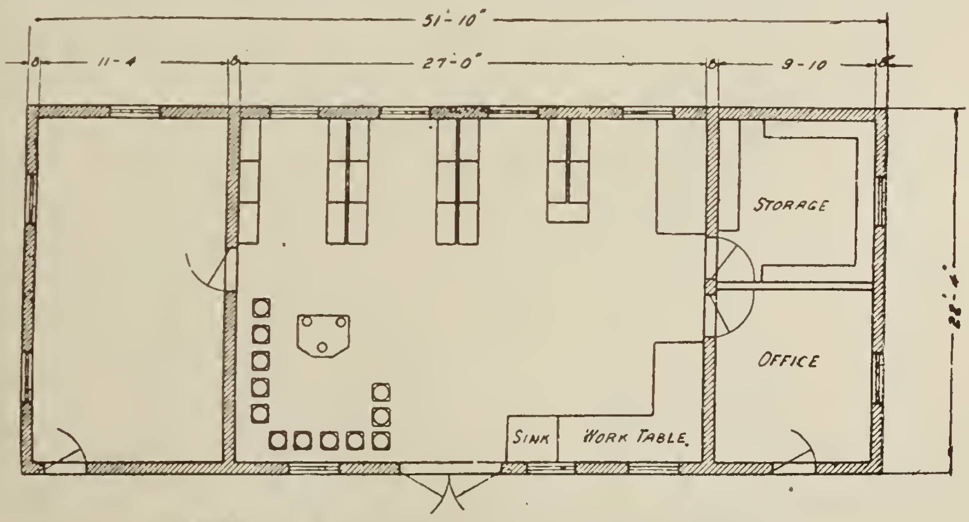
The rescue corps are made up of six men each. It is planned to give each corps a complete course of training—consisting of ten lessons—immediately after volunteering, and, then, have them meet once a month that they may be kept familiar with the apparatus and be able to answer a call instantly.

**Nova Scotia Steel and Coal Company.**—This company has a rescue, fire and first-aid station. It was formerly in a room in the general office building, but is now in a railway car. This car is always held in readiness to go to any of the collieries owned by the company or to any colliery in the province with which rail connections can be made. It is an ordinary passenger car and is divided into three sections.

Car Section No. 1.—This section is fitted and furnished for the accommodation of the rescue crew.

Car Section No. 2.—This section is fitted with:

16 sets of rescue apparatus.
24 oxygen cylinders.
2 oxygen-refill pumps.
1 pulmotor.
2 dozen electric safety lamps.
1 electric charging device for charging electric lamps.




**PLAN OF CENTRAL RESCUE STATION, SHOWING APPARATUS ROOM AND EMERGENCY HOSPITAL**

The company has now a large number of men trained in the use of the apparatus. It has been successfully used on several occasions, notably at Sydney Mines and at Stellarton. Apart from the rescue work, there are a number of men trained in first-aid and ambulance work, there being properly fitted ambulances to serve all the collieries.

**Acadia Coal Company.**—This company has a training station in which the men are instructed in the use of portable breathing apparatus. The station consists of a building 20 feet by 40 feet, in which the aparatus is installed and lessons are given in its use in a breathable atmosphere. The smoke room, where the men test the apparatus before going into the mine, is about the same size as the station. The company intends to place a number of obstacles in the smoke room to simulate the interior of a mine, so that the men may be trained under conditions similar to those that exist underground.

The equipment consists of ten helmet type Securitas apparatus, each with two hours' oxygen supply at-

1 Draeger oxygen reviving trunk.
6 ordinary respirators.
Blue print plans of all the collieries.
1 set of portable telephones.
Canaries for gas testing purposes.

Other accessories which are necessary in the event of a mine explosion, are also stored in the car. Section 2 also contains stretchers, splints, oil, restorators, and drugs of all kinds which might be necessary in case of accident.

Car Section No. 3.—This section contains fire reels, hose, fire buckets, ladders, axes, saws, fire extinguishers and all the necessary equipment for use in case of fire. The car is furnished with blankets, cooking stove, and all articles necessary to enable the crew to live on board the car for short periods of time.

The types of rescue apparatus used are, fifteen of the Draeger helmet-type and one of the Ever-Ready mouthpiece type. These have an oxygen capacity for about two hours' effective work.

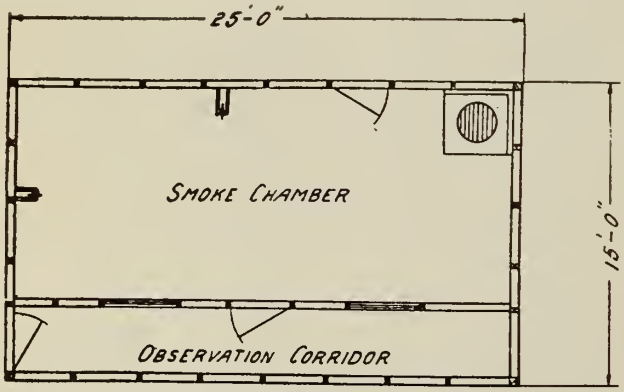
Of the twenty-four oxygen cylinders, only seven are carried in the car, the others being stored as an emergency supply. The capacity of these cylinders is 100 cubic feet of oxygen at a pressure of 125 atmospheres. In connection with the breathing apparatus, a smoke house is constructed for the purpose of giving the men practice in using the apparatus in an irrespirable atmosphere. The smoke house is centrally situated and is built in such a way that while they are at work in the unbreathable atmosphere, the men can be observed by the head trainer from the passage way.

There are at present about forty men, including all the officers in connection with the collieries, who are trained in the use of the rescue apparatus. In addition to this number, twenty-four officers of the company hold certificates of proficiency in giving first-aid to the injured, granted by the St. John's Ambulance Association.

In connection with this work there are also ambulances, stretchers and blankets at each colliery, while in the rescue car there is a first-class ambulance fully equipped with every convenience for the conveyance of injured men from the car to the hospital or their homes.

## ALBERTA.

In this province, no statutory provision is made for compulsory mine-rescue training and equipment at coal mines. The opinion seems to be that it is better to have one or more central stations with officials in charge of the stations who will be responsible for the upkeep of the apparatus.




PLAN OF SMOKE CHAMBER

*By Courtesy of F. W Gray, Dominion Coal Company*

At present. there is only one mine-rescue station in Alberta. This is a temporary station situated at Blairmore and is available for all the mines in the Crow's Nest Pass district. An additional rescue station is now being erected at Lethbridge, and, in a short time, a third will be established at Kipp. The Blairmore station has only been in operation since March, 1912. One-half of the cost of the equipment and operation of this station will be borne by the Government of Alberta, and one-half by the different operators in the district. It is expected that, within a short time, a railway car will be fitted up with rescue apparatus and moved from mine to mine.

The station in use at present consists of three rooms, each 24 feet by 14 feet; the apparatus is kept in one; another room is fitted up as an office and lecture room; and the third is a smoke chamber.

The station is under the charge of a superintendent holding a mine manager's certificate. The training, which occupies six days, is divided into the following sections:

First day—Description of apparatus by superintendent and taking apart and putting together of apparatus by persons being trained.

Second day—Lecture on apparatus for one hour and wearing of apparatus in smoke chamber for one hour.

Third day—Wearing of apparatus in mine for one and a half hours and further lecture on apparatus.

Fourth day—Wearing of apparatus in mine and in smoke chamber for two hours.

Fifth day—Wearing of apparatus in mine for two hours.

Sixth day—Wearing of apparatus in mine for one and a half hours, and in smoke chamber one hour.

This training is varied slightly according to the discretion of the superintendent. While in the smoke chamber, a considerable amount of work is done in sulphur smoke, such as building stoppings, putting up and taking down brattice, and general work as nearly as possible similar to that which would be required to be done in a mine during rescue work.

While in the mine, the wearers of the apparatus travel up a roadway pitching about 40 degrees, for a distance of about 450 feet and come out at the surface. The authorities have not yet decided upon the exact routine of training work and may vary this considerably. After a man has gone through six days' training, it is the intention to bring him back at the end of three months to undergo another training, and again, at the end of a further three months, after which he will, if judged to be satisfactory, be granted a certificate showing that he is capable of doing rescue work in a mine after an explosion.

Primarily, the training work has been considerably handicapped by the difficulty in obtaining a sufficient supply of oxygen and soda. In order to overcome this, however, it is the intention to carry on hand a stock of 3,000 cubic feet of oxygen at a pressure of 120 atmospheres, and 1.500 lbs. of caustic soda.

At this station there are eleven Fleuss apparatus of the two-hour type and six of the one-hour type. This will probably be increased to fifteen of the two-hour type and ten of the one-hour type.

## BRITISH COLUMBIA.

The Coal Mines Regulation Act, 1911, makes provisions for rescue apparatus at mines, as follows:

"There shall be established by the owner, agent or manager of every colliery such number of oxygen helmets or some form of mine-rescue apparatus as may be approved by the Minister of Mines.

"Such mine-rescue apparatus shall be constantly maintained in an efficient and workable condition, and shall in all cases be so stored or placed in or about the mine as to always be available for immediate use.

"The Lieutenant-Governor-in-Council may from time to time establish mine-rescue stations for the purpose of supplementing, in case of need, the colliery installations of mine-rescue aparatus, and also for the purpose of training the holders of certificates of competency under this Act in the use of such mine-rescue apparatus as may be approved by the Minister of Mines; and it shall be incumbent on the owner, agent or manager of every operating mine to have all certificated officials who are physically fit, and not less than three per cent. of such number as the Chief Inspector of Mines may deem sufficient, of the workmen, trained in the use of such established mine-rescue apparatus:

"Provided that in cases of emergency such stations shall be available for the use of any trained corps of mine-rescuers, duly qualified medical practitioners, or corps trained in the work of first aid to the injured, subject, always, to the order of an Inspector of Mines."

Although this Act has only been in force a little over a year, the operators, as well as the Government, are doing all in their power to lessen the number of fatalities incident to mine explosions and mine fires in so far as this can be accomplished by trained men equipped with suitable breathing apparatus.

The Government of British Columbia has secured sites for rescue stations at Fernie, in the Crow's Nest district, and at Nanaimo, Vancouver Island. Tenders have been called for the erection of the buildings and they will be completed at an early date. The illustration facing page 28 shows the plan and elevation of these buildings.

The Government owns the following apparatus:

12 sets of two-hour, 1910 model, helmet type Draeger apparatus.

8 sets of one-half hour, mouth-breathing type Draeger apparatus.

4 pulmotors.

42 oxygen tanks, of 100 cubic feet capacity each.

14 electric safety lamps, together with all necessary accessories and spare parts.

They have also under order two sets of two-hour, 1911 model, mouth-breathing type Draeger apparatus and sufficient material to convert the present 14 sets of 1910 model, helmet-type into mouth-breathing type. These apparatus will thus be available either as helmet or mouth-breathing apparatus. Two stretchers equipped with oxygen breathing apparatus and 16 trunks for storing and shipping the apparatus, are also on order.

The present distribution of this apparatus is as follows:

**Nanaimo—**
- 4 sets of two-hour apparatus.
- 2 sets of one-half hour apparatus.
- 1 pulmotor.
- 12 oxygen tanks.
- 1 oxygen pump.
- 4 electric safety lamps.

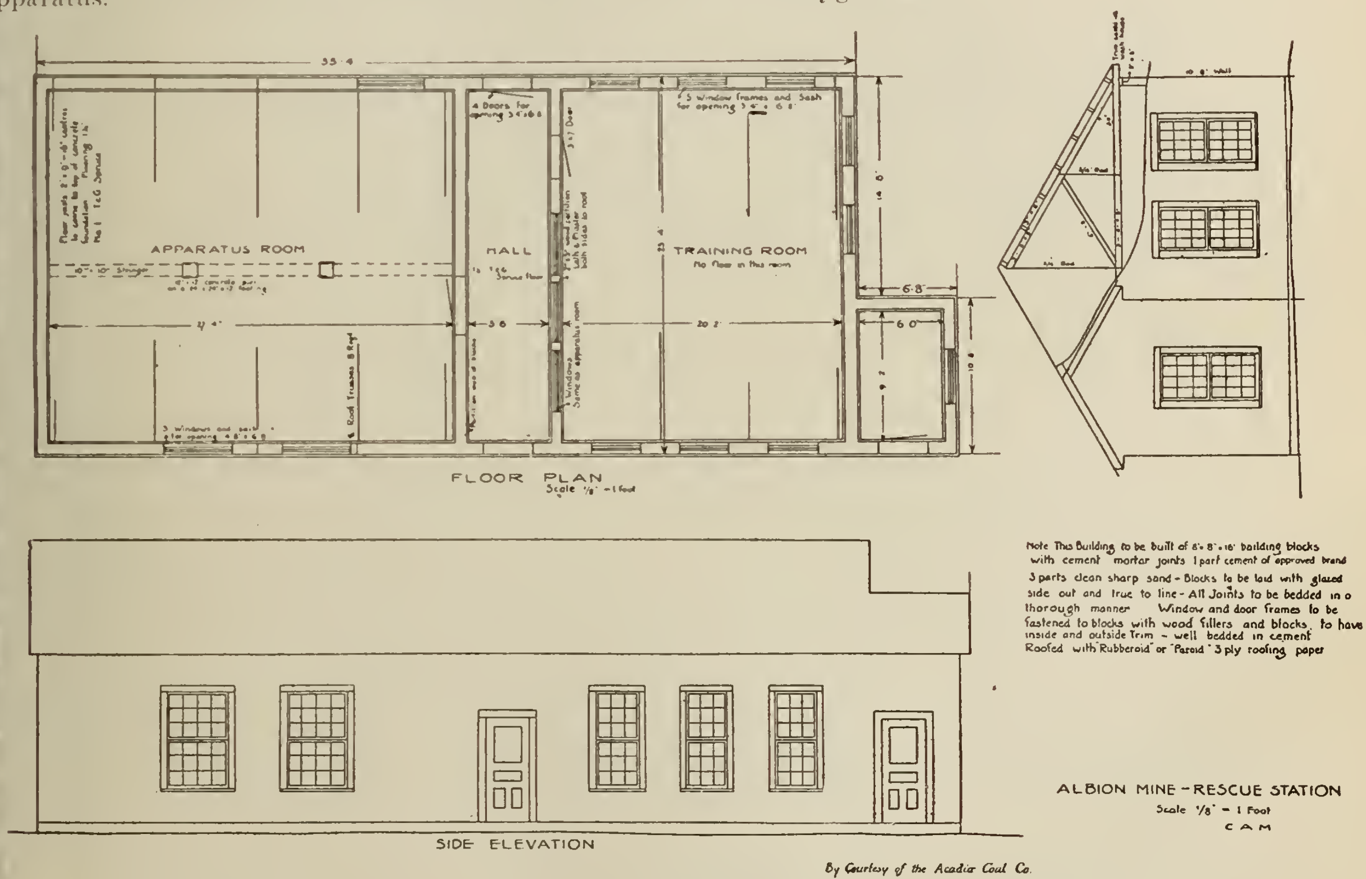
**Cumberland—**
- 4 sets of two-hour apparatus.
- 2 sets of one-half hour apparatus.
- 1 pulmotor.
- 12 oxygen tanks.
- 1 oxygen pump.
- 4 electric safety lamps.

**Hosmer—**
- 4 sets of two-hour apparatus.
- 2 sets of one-half hour apparatus.
- 1 pulmotor.
- 14 oxygen tanks.
- 1 oxygen pump.
- 4 electric safety lamps.

**Middlesboro—**
- 4 sets of two-hour apparatus.
- 2 sets of one-half hour apparatus
- 1 pulmotor.
- 4 oxygen tanks.
- 2 electric safety lamps.

This apparatus is supplementary to the equipment of the coal companies and at present is taken care of by the Western Fuel Company, at Nanaimo; the Canadian Collieries (Dunsmuir), Ltd., at Cumberland; the Hosmer Mines, Ltd., at Hosmer, and the Nicola Valley Coal & Coke Co., Ltd., at Middlesboro.

**Mining Companies and their Equipment.**—All the operating companies own, or have on order, oxygen apparatus of some type, and some companies own very creditable stations for training purposes.




PLAN OF ALBION MINE-RESCUE STATION, ACADIA COAL CO.

Western Fuel Co., Nanaimo.—This company erected the first station in the province. It was opened in the autumn of 1910, and, since that time, 62 employees of the company have taken a course of training in it and have been awarded certificates of competency. These employees have been formed into 12 corps.

This company's station is of frame construction on concrete foundation and is covered with corrugated iron. The inside is finished in hard wall plaster, its dimensions being 24 feet by 48 feet. It consists of a smoke room and work room, the latter containing the cases for the apparatus.

The apparatus consists of

4 sets two-hour, 1907 model, helmet-type Draeger apparatus.
4 sets two-hour Fleuss (Proto) mouth-type.
3 sets one-hour Fleuss (Salvator) mouth-type.
1 pulmotor.
12 oxygen tanks.
1 oxygen pump.
4 electric safety lamps (Draeger type).
6 electric safety lamps (Fleuss type).

The work necessary to obtain a certificate consists in becoming familiar with the principle and construction of the apparatus, in assembling and dissembling the same and in the use of the pulmotor.

Then a team of four men must perform the following two-hour schedule of work not less than seven times, in the smoke room filled with either sulphur or formaldehyde fumes:

1. 15 laps around the smoke room, travelling over the overcast and crawling through the tunnel, which is 3 feet high and 4 feet wide.

2. Hang 8 yards of brattice cloth over the overcast, and erect 4 yards of board brattice in the tunnel, all material being brought over the overcast.

3. Make 10 laps around the smoke room over the overcast and through the divided tunnel, take down the board and cloth brattice, placing it where found.

4. Each pair of men to carry a dummy on stretcher, weight 150 lbs., twice around the smoke room, over the overcast and through the tunnel, using both the Sylvester method and Draeger pulmotor for resuscitation purposes.

5. Erect a board regulator in the centre of the tunnel area 18 inches by 18 inches, each pair of men to take the dummy without the stretcher once around the room over the overcast and through the regulator; then each member of the crops to make 10 laps without the dummy.

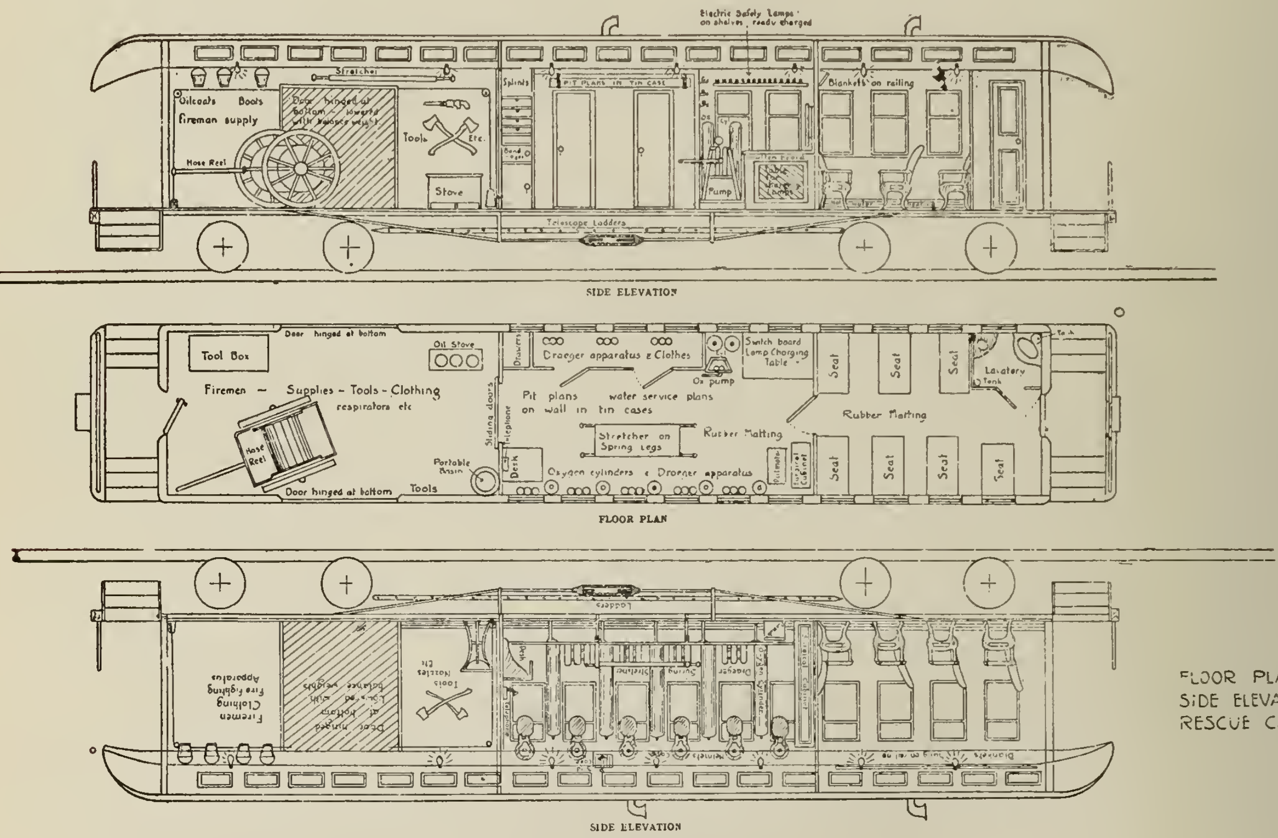
6. Take down the regulator and erect in the middle of the tunnel a brick stopping 1½ bricks thick, carrying all material over the overcast. Take down stopping, carrying material back to place where found and piling up neatly.

7. The top of the tunnel is then raised against the wall to prevent crawling, and as many laps made around the smoke room and over the overcast as can be made within the two-hour limit.

A record is kept of each man's work, including amount of oxygen upon entering, and upon coming out, length of time in the smoke room, and his general condition when he comes out.

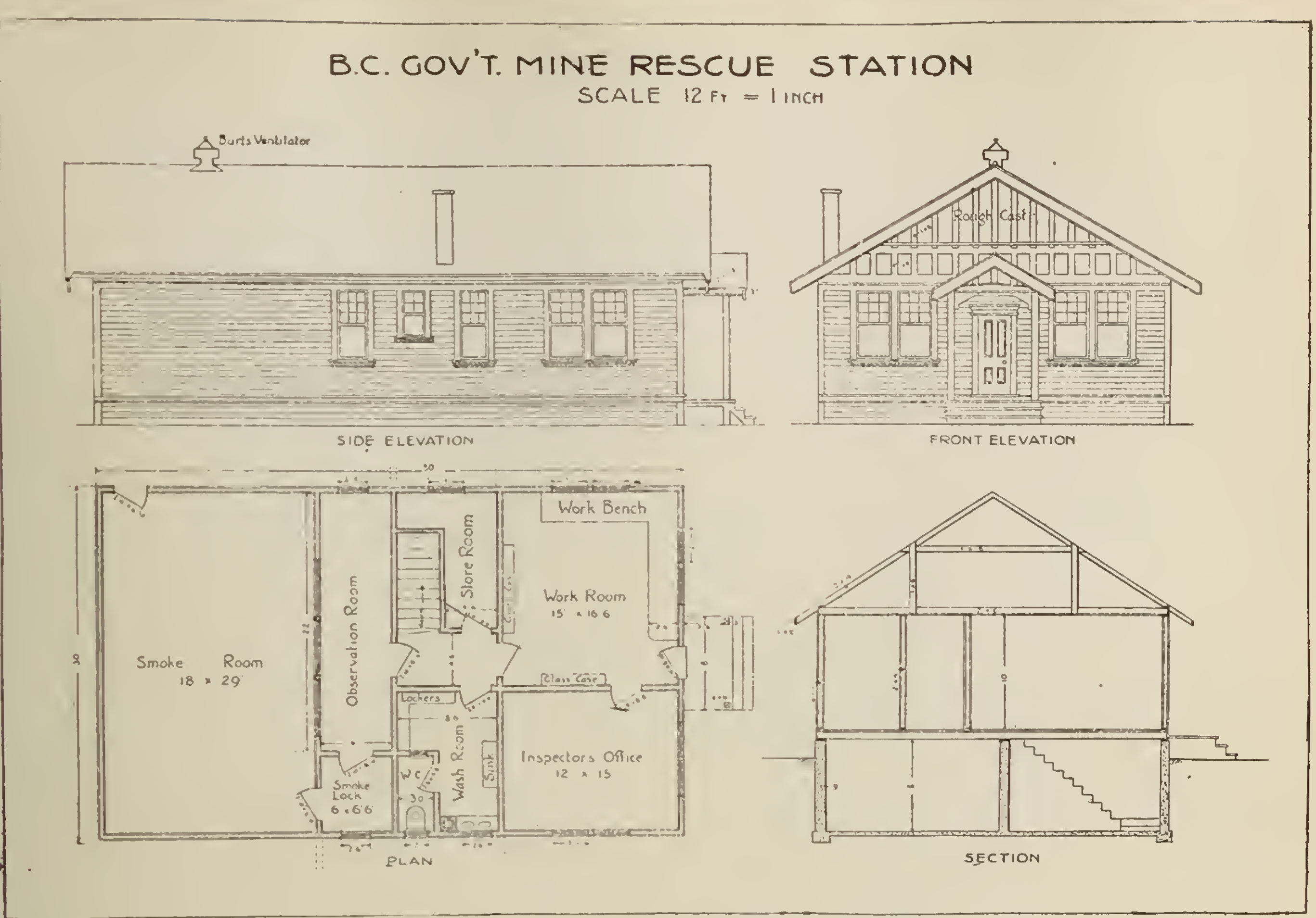
The lamp used is either Wolf safety lamp or Electric safety lamp. Each person holding a certificate must report for practice once every month. An instructor is in charge of the station and in daily attendance. The illustration facing page 29 shows this station.

Canadian Collieries (Dunsmuir), Ltd., Extension Colliery, Extension.—This company has just completed a station of frame construction 25 feet by 53 feet, which




FLOOR PLAN & SIDE ELEVATION of RESCUE CAR

PLAN OF RESCUE CAR, NOVA SCOTIA STEEL & COAL CO.




*By Courtesy of B. C. Department of Mines* PLAN OF RESCUE STATION, GOVERNMENT OF BRITISH COLUMBIA.

contains a smoke room, observation room, work room and dressing room.

The course of training consists of preliminary work to give the candidates an introduction to the apparatus, and the method of wearing it, travelling through the various openings in the smoke room, without smoke. This is followed with such practical work as fixing brattice, both cloth and board, cleaning up caves, building stoppings, brick and board, and a stretcher drill in which dummy is rescued from place of danger and carried to place of safety. Mr. J. H. Cunningham, who has taken a course of training at the United States Rescue station at Seattle, Wash., will be the instructor.

The equipment at this station consists of:

4 sets, two-hour, 1910 model, helmet-type Draeger apparatus.
1 oxygen pump.
4 oxygen tanks.
4 electric safety lamps( Draeger type).

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# THE INTERMITTENT SYSTEM IN CYANIDATION

By Leon P. Hills.*

The popularity of the continuous system in direct cyanidation is, I believe, an unfair verdict against the intermittent system. The former undoubtedly sprang from the difficulties encountered in the latter in promptly effecting a condition of suspension in the charge to be agitated, clogging of pipes, etc. All of these difficulties can be wholly obviated at present, one means being by the use of the agitator hereinafter described.

Theoretically, the charge system surpasses the continuous. The latter is, by its very nature, inefficient. Assume a series of 100-ton tanks, with a flow of 10 tons per hour. Consider the efflux from the first tank for any given hour. That 10-ton portion is composed of, approximately:

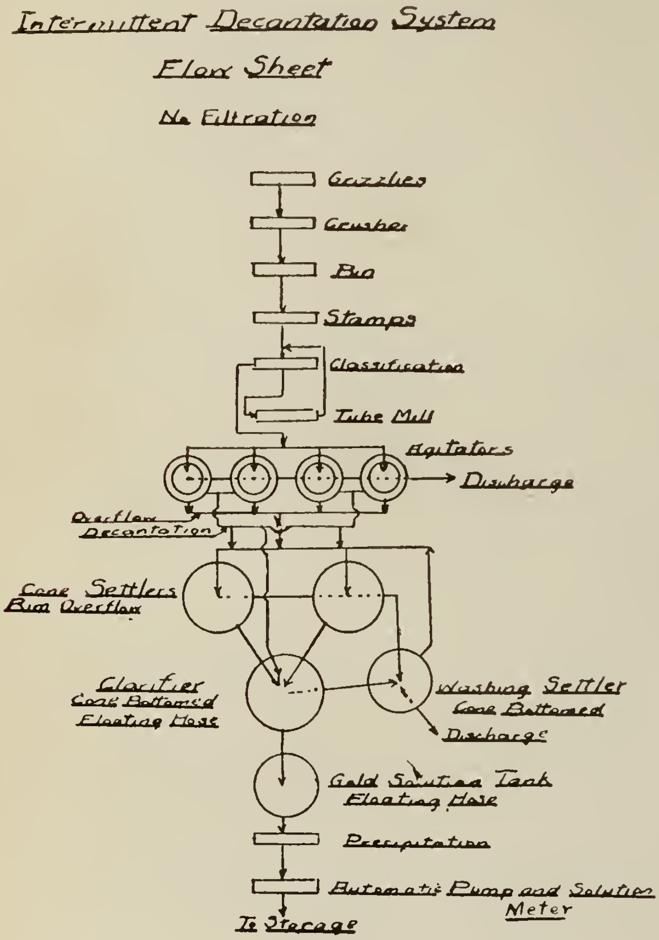
0.090 tons of the influx of the given hour.
0.825 tons of the first preceding hour.
0.751 tons of the second preceding hour.
0.683 tons of the third preceding hour.
0.621 tons of the fourth preceding hour.
0.565 tons of the fifth preceding hour.
0.513 tons of the sixth preceding hour.
0.466 tons of the seventh preceding hour.
0.424 tons of the eighth preceding hour.
0.386 tons of the ninth preceding hour.
0.351 tons of the tenth preceding hour.

the remaining 3½ tons in diminishing portions back to the initial inflowing 10 tons. The great bulk of the pulp receives exceedingly long treatment, the time of treatment of different portions varying between wide limits.

*Manager United Mines Co.'s Cyanide plant, Tuolumne, Cal. Article from the Colorado School of Mines Magazine.

Also the heavier and coarser particles make the most rapid transit through the series, thus that portion requiring the longer treatment gets the shorter treatment. The ideal system, wherein the pulp receives the exact treatment required to perfect extraction, can be closely approximated in the intermittent system.

The accompanying flow sheet illustrates an intermittent decantation system for which the following merits can be reasonably claimed: Simplicity, cheapness of installation, economy of power and labor, low cost of maintenance, flexibility of operation.




The agitator is the chief feature of this system, and insures reliability of operation. It is a modification of the Pachuca, the central fixed column being surrounded by a vertically adjustable column of a few inches greater diameter. This outer column, by means of a screw at the top of the tank, may be moved from a position where the lower end of the column is in contact with the sides of the cone, to any predetermined point above that, the upper extremity of the column always being below the surface of the solution. During the time agitation is suspended and settling is taking place the outer column is in its lowest position, thus excluding the pulp from settling around the inner column and air jet. To start agitation turn the air on, which will institute circulation of solution down between the two columns and up through the central column, whereupon the outer column is raised, allowing the pulp to enter into the circulation. This agitator has been subjected to all kinds of tests and never failed to get the pulp into a condition of suspension and without the aid of additional air.

In the system under consideration a thickener to precede the agitators is not necessary. The agitator is provided with a baffle which gives a circumferential quiet zone when pulp is being run in and when agitation is taking place, the overflow going to cone settlers. When a charge is sufficiently thickened in the agitator, the pulp is switched to another agitator, and agitation started in the charged tank. During agitation barren solution may be run in to lessen the gold contents and also to vitalize the solution in the tank.

The extraction being completed, the outer column is screwed down, agitation suspended, pulp settled, solution decanted, and washes repeated as many times as is advisable, depending on the richness of the ore. The settlings from settlers and clarifier are drawn off intermittently to washing settler, or agitator, and washed.

In this system exists the condition that the finer pulp, in which the extraction is rapid, receives the short treatment and the heavier and coarser pulp receives longer treatment.

# THE CANADIAN MINING INSTITUTE

## THE COUNCIL'S ANNUAL REPORT

The following is a copy of the report of the Council of the Canadian Mining Institute for the year 1912, to be presented at the annual meeting at Ottawa on March 5th, next:

The Council has much pleasure in submitting the following report of the work of the Institute for the year ending December 31st, 1912:

### MEETINGS.

The fourteenth annual general meeting, held in Toronto on March 6th, 7th and 8th, was notably successful, the large attendance of two hundred and seventy-four, or, approximately, twenty-five per cent. of the present membership, being a specially gratifying feature; while the presence also of a number of distinguished engineers and geologists from the United States, and one from Great Britain, many of whom took a prominent part in the proceedings, contributed materially to the interest and success of the occasion. At the close of the meeting the visitors were afforded the opportunity of visiting the mines of the Porcupine and Cobalt districts, under the auspices of the Institute.

The first of what is hoped will be regular series of semi-annual, or Western meetings, was held in September in Victoria, B.C., and in Frank, Alta. The papers presented at these meetings were productive of interesting discussions, and the Council has every reason to believe that Western members both realize and appreciate the advantage of the innovation.

Other meetings under the auspices of the respective branches have been held at Sherbrooke and Montreal, in Quebec, Cobalt, Porcupine, Kingston, and Toronto, in Ontario; at Lethbridge, in Alberta, and at Vancouver, in British Columbia.

### BRANCHES.

The organization was effected in September, of the Rocky Mountain Branch, and in December, of the Ottawa Branch. To the former, members resident in southeastern British Columbia and southern Alberta as far east at Medicine Hat, will be attached, although provision is made that the British Columbia members shall as well continue to be associated with the Western Branch.

Proposals were under consideration during the year for the affiliation of the provincial mining societies of Nova Scotia with the Institute, and the President specially visited Halifax last spring to discuss the project. It was found, however, that satisfactory arrangements could not be made at the present.

### PUBLICATIONS.

The aim of the Council is to raise the standard of the Institute's publications to the highest possible level, and to this end all papers submitted for publication have been critically scrutinized, and those only accepted that appeared to the Publication Committee to contain information of real value to members. Some additional expense, however, has been incurred in securing a better grade of paper-stock for use in the printing of the volume of the transactions, and particular care has been taken to ensure that the half-tone illustrations shall be satisfactory. In view, however, of the considerable recent advances in the cost of printing, the Council decided that economy might be best effected by discontinuing the practice of printing papers in advance form in the Quarterly Bulletin, and henceforward separates of papers will only be supplied upon direct application.

The Secretary has completed the compilation of a General Index of Volumes I to X, inclusive, of the Journal of the Institute, and has included therewith summaries of the papers contained in these volumes, the majority of which are out of print. This work is now in press, and will be ready for distribution early in the spring. It is proposed to offer it on sale to members at practically the actual cost of production.

### MEMBERSHIP.

The Council would particularly direct attention to the gratifying fact that the membership, inclusive of all classes, now numbers over one thousand, the actual number being 1,035. The accessions during the year were as follows:

| | |
|---|---|
| Ex-officio | 6 |
| Members | 127 |
| Associates | 34 |
| Students | 3 |
| Total | 17 |

The losses by death, resignations, and removal were as follows:

| | |
|---|---|
| Deaths | 5 |
| Resignations | 18 |
| Removals | 26 |
| Total | 49 |

### LIBRARY AND READING ROOM.

The accessions to the library represent 136 volumes. The library and reading-room have been used freely during the year, both by members visiting headquarters and by strangers to whom the courtesy has been extended.

### STUDENTS' COMPETITION AND AWARDS.

Ten papers were submitted by student members in competition for the Institute's awards. The judges have recommended that a prize of twenty-five dollars be awarded to E. Futterer for his paper entitled "The Champion Mine"; while Mr. J. C. Jones' paper on the "Joplin District," is given honourable mention.

### GENERAL.

In conclusion, it is gratifying to be able to state that the affairs of the Institute are now in a more flourishing condition than at any previous time in its history. The membership, as already stated, is increasing steadily; organization by the establishment of branches throughout the country is being perfected; the publications are vastly more valuable than in the past, and, in general, the Institute is growing in strength and usefulness.

# THE INTERNATIONAL GEOLOGICAL CONGRESS

On Saturday, January 18th, Mr. G. G. S. Lindsey, speaking before the Toronto Branch of the Canadian Mining Institute, gave a very interesting outline of the work of the Twelfth International Geological Congress, and of the preparations being made for the Canadian meeting next summer. The visitors, Mr. Lindsey pointed out, are to be officially the guests of the Dominion and Ontario Governments, of the Royal Society of Canada, and of the Canadian Mining Institute. In reality, however, other Provincial Governments and several transportation corporations will help to bear the large burden that the reception of such a number of distinguished visitors implies.

The founding of the Congress was inspired, continued the speaker, by the collection of geological maps and sections from various regions of the Continent, as well as from many countries of Europe, for display at the International Exhibition in Philadelphia in 1876. The advantage of such comparative study so deeply impressed visiting geologists that at the annual meeting of the American Association for the Advancement of Science, held in Buffalo, August, 1876, a committee was appointed to arrange for an International Congress of Geologists at the 1878 Paris Exhibition. It may be noted here that Dr. T. Sterry Hunt was secretary of this first committee—the Comite Fondateur of 1876, and that at the first session of the Congress (1878) Messrs. A. R. C. Selwyn, F.R.S., T. Sterry Hunt, and Paul de Caze were the Canadian delegates.

The records of subsequent meetings, which are usually held every three years, are shown in the following table:

**Number of Members, Delegates, Vice-Presidents and Countries Represented at Each Congress.**

| Country, Year. | Members. Enrolled. | Attdg. | Del. | Vice-Pres. | Rep'd. |
|---|---|---|---|---|---|
| France, 1878 | 310 | | 7 | 18 | 23 |
| Italy, 1881 | 420 | 224 | 23 | 19 | 23 |
| Germany, 1885 | 455 | 258 | 15 | 20 | 22 |
| England, 1888 | 337 | 140 | 68 | 22 | 25 |
| U. S. A., 1891 | 546 | 251 | 39 | 31 | 24 |
| Switzerland, 1894 | 401 | 273 | 18 | 15 | 20 |
| Russia, 1897 | 1037 | 704 | 139 | 40 | 27 |
| France, 1900 | 1016 | 461 | 80 | 46 | 31 |
| Austria, 1903 | 664 | 393 | 39 | 25 | 30 |
| Mexico, 1906 | 707 | 321 | 83 | 27 | 33 |
| Sweden, 1910 | 857 | 625 | 262 | 74 | 36 |

The members of the Congress are usually professional geologists, or persons occupied in an allied profession. Amateurs, however, are welcomed, and their work has often been of great importance. Delegates are members of the Congress who have been specially appointed to represent a government, university, or society. Vice-Presidents are members of the Congress, usually delegates, elected at the first meeting of each session to represent their country on the Council of the Congress.

Geologists from every quarter of the globe attend the Congress. The word "International" in the title was well chosen since a remarkable number of nationalities are represented at each Congress.

The members may be divided roughly into three classes:

1st. Professors and teachers from the leading universities, colleges, and technical schools.

2nd. Officers of government geological surveys or equivalent organizations.

3rd. Geologists and mining engineers in private practice.

The Congress is governed by a Council constituted as follows:

(a) Members of the Organization Committee to Twelfth Congress.

(b) Presidents of geological societies.

(c) Directors of important geological surveys.

(d) Members of the "Bureau" (i.e., Vice-Presidents of other office holders elected by the members at their first meeting).

(e) Members of the Congress whom the Council may add to its number.

The "Bureau" is made up of persons whose names, submitted by the Council, have been approved by the members at the first meeting of the Congress. It is charged with the arrangements of the orders of the day for the meetings.

An Organization Committee, or an Executive Committee, is appointed for each session by the Government or institution whose invitation for the ensuing session has been accepted at the previous session, and local arrangements are left to these local organizations. The General Secretary of a session is responsible for the management of Congress affairs until next sesion has met and hi successor has been duly appointed.

The prime object of the International Geological Congress is the advancement of knowledge both in the field of pure geological science and in its application to the arts and industries. The principal means to this end are:—

1. Meetings. 2. Publications. 3. International Committees. 4. Excursions. 5. Prizes.

1. The meetings are held every three years in different countries, and are attended by members represnting very civilized nation. The leading countries, societies, and universities are represented by specially appointed delegates. Papers are read and discussed bearing on topics of scientific or economic importance. These topics are selected in advance so that every member interested is given a chance to take part.

2. Publications.—The transactions of the Congress, containing the more important papers and discussions, and a general report, are published as soon after the session as possible. The Transactions of the Eleventh Congress contained 1,413 pages. Two quarto volumes and a large atlas on the iron ore resources of the world were also brought out, together with another large quarto.

3. The International Committee deal with such questions as the standardization of nomenclature, general geological maps, etc., etc.

4. Excursions have become the outstanding feature of the sessions. They are conducted at small expense to the individual and are under expert guidance. It were superfluous to dwell upon the value of these both geologically and from a mining point of view.

5. The Congress possesses the necessary powers for awarding prizes for special achievement in pure or applied geology. The Spendiarow prize, founded by Mr. Spendiarow, of St. Petersburg, in memory of his son, is awarded at each Congress for the most important work accomplished by an individual since the preceding Congress.

Referring again to the excursions, it may be that they will be conducted for the benefit of members of the Congress who are geologists, mining engineers, geographers, or are otherwise engaged in the study or application of some branch of geology. If possible, arrangements will be made to enable the wives of members to participate in the excursions. To reserve accommodation, application must be made in writing on the form provided, and must also be accompanied by the specified deposit. No deposit will be returned after the fifteenth day of June, 1913.

The International Geological Congress will hold its twelfth meeting in Toronto from the 7th to the 16th of August, 1913. Headquarters will be at the University of Toronto. Both before and after the Toronto sessions there are numerous excursions covering practically all Canadian territory available by railway and of interest to excursionists.

[Editor's Note.—The full schedule will be published in a forthcoming issue of the Canadian Mining Journal.]

The topics to be discussed at the sessions of the Congress are varied. First in importance is the subject of the coal resources of the world. Following the example of the Eleventh Congress, there is to be published (it is hoped in time for the Toronto sessions) a large compilation covering the world's known coal resources, and discussion will crystallize round this volume. Other subjects, such as differentiation in igneous magmas, the influence of depth on the character of metalliferous deposits, the origin of pre-Cambrian sedimentaries, and many other questions will be debated. As many of the most eminent authorities in the world will join in these discussions, there is no hyperbole in saying that history will be made.

. . . . . .

The International Geological Congress has accomplished the magnificent task of compiling geological maps of the continent of Europe. In this work it has received the hearty co-operation of the various international governments and of many emminent men of science. The published volumes on the Iron Ore Resources of the World, and the forthcoming volumes on the Coal Resources of the World, will be lasting monuments to the fame of the Congress. To quote an apt sentence from an official circular: "The Congress serves in a sense as an international clearing house for geology." It consolidates and clarifies the results of current investigation, and raises the whole science to a better and loftier plane.

Other sessions have been held under the direct patronage of the King or President of the country where the gatherings took place. The Canadian Congress will be under the Presidency of the Governor-General, His Royal Highness the Duke of Connaught.

No one can measure the good that will accrue to Canada from the meetings and excursions of the Congress. Apart from the direct advertisement thus given our country, there will inevitably be given a strong impetus to education, research, exploration, and actual mining development.

[Editor's Note.—All the civilized countries of the world have sent in contributions with maps on their coal resources, and these with about one hundred pages of condensation and correlation will make up the three volumes dealing with this important subject. There will be two quarto volumes of letterpress and a large volume of maps, published by Morang & Company, of Toronto, which is a guarantee that it will be well done. The volumes will be ready for distribution when the Congress meets, and we propose in a subsequent issue to give a detailed account of the countries contributing. An immense amount of information for the first time will be made public in thes volumes. The system of classification which was adopted by the Coal Resources Committee met with universal satisfaction, not a single objection having been raised to it.]

# THE HAILWOOD GAS-CAP OBSERVATION MACHINE*

By E. A. Hailwood.

The Hailwood gas-cap observation machine, which calls for no expert knowledge on the part of the operator, and requires no motor or similar auxiliary and expensive device, is made in two types, i.e., the drum-type and the gallery type.

In attempts at standardizing the apparatus, difficulty was experienced in arriving at a suitable method of fixing a constant pressure of the ingoing gas. Owing to the comparatively small quantities required to make mixtures of even up to 5 per cent., it was found to be practically impossible to properly control the pressure on the ordinary gas mains with valves, water-gauges, ordinary gas- pressure regulators and variable regulating valves. The regulation of ordinary gas-pressure regulators, to correspond with certain readings of the water-gauge, did not prove sensitive enough, because, in the first machine, on changing the nipples, the bore of which varied to represent varying percentages, it was found that the mixture did not always correspond, the results also varying from day to day. A reduction in the bore of the nipple apparently caused the gas to rush through at a quicker and uncertain velocity; possible the reduction of bore caused a back resistance, which created an accumulation of gas under pressure between the nipple and the water-gauge or ordinary pressure regulator, this accumulated pressure evidently causing the increased velocity, which upset the calculations of desired variations in the gas mixture for certain variations in the bore of the nipple. For most general purposes such a variation would have been of no moment, but for gas-cap observation, in which a variation of 0.5 per cent. is important, this uncertainty was a serious drawback, especially when the constant fluctuation in pressure of town gas is also borne in mind. In the gallery-type the difficulty has been overcome by allowing all surplus and back-pressure gas to escape through a water or glycerine seal, the supply of gas, in consequence, being received from a source always maintained at one definite pressure, and the mixture therefore now responds to the several variations in the bore of the regulating valve, which represents the various percentages of gas.

The very small quantity of gas consumed in these machines allows of their use in an ordinary room, in contrast to other apparatus, especially of the motor type, which require such a comparatively large quantity of gas that the outlet must be connected to the outside atmosphere, when, if the wind be blowing in a certai ndirection, the amount of air blown back into the apparatus, or the resistance to the free exit of the gas-mixture, may possibly dilute or upset the percentage.

The lamps are not open to the ordinary atmosphere, and should therefore truly indicate the actual mixture in which they stand. In a test with a machine open towards the bottom, a distinct diminution in the cap was observed when the gas-mixture was driven at the lamp in a vertically descending direction, as compared with the cap obtained when the same gas-mixture was horizontally received. The gas-mixture escape was at the bottom of the chamber in the first set of tests, and at the opposite side in the second. The difference was particularly marked in the higher percentages, of say 5 per cent. upwards. This would seem to point to the possibility of inaccurate readings

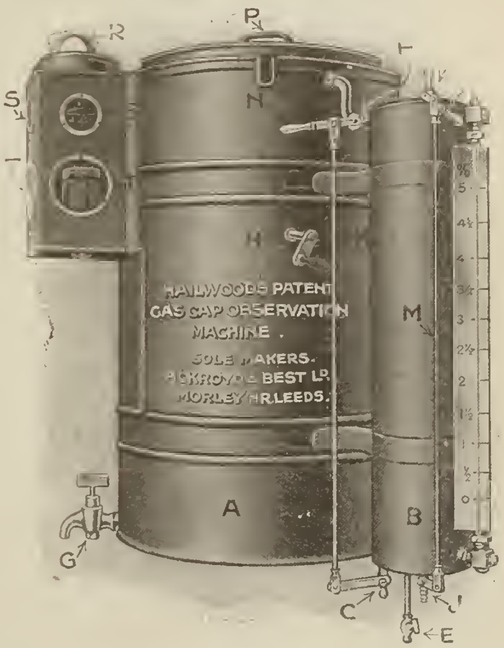



Fig. 1.

in the past, as if when sending gas downwardly at a lamp it requires more than 7 per cent. to give the "7 per cent. standard reading of the gauze being full of flame," it would seem to follow that, as the starting percentage is wrong, subsequent percentages obtained by the insertion of nipples of varying bore may also be wrong to a corresponding degree. In the gallery-type the great length of the gallery, the comparatively low velocity of the mixture, and the several mixing-plates, ensure a uniform blending of the mixture, which, the writer contends, is obviously better

*Abstract of paper read before the Institution of Mining Engineers.

than the method in which the gas is driven down at a high velocity on to the lamp. In the latter method, probably the great velocity, and the large open mouth of the chamber, admit of eddy currents of varying degree of dilution forming, and, therefore, the percentage of gas in different parts of the chamber may vary, and lamps of different heights may have their flames at other than the position at which such apparatus was calibrated.

In both types the lamp is completely enclosed in the gas-mixture, in the former the carbonic acid being absorbed as described, while in the latter the products of combustion from the lamp flame pass away through the chimney of the apparatus. Owing to the smallness of the usual testing-flame, the consumption of oxygen is comparatively low, and in any case the writer would suggest that his system apparently is better than one in which any part of the lamp is open to an atmosphere other than the gas-mixture, such, for instance, as the device in which the gas-mixture is sent into the middle portion of the lamp, apertures being left open at the top of the lamp for the escape of the consumed gases. In this case there is a great possibility of ordinary air, owing to its relatively higher specific gravity, de-

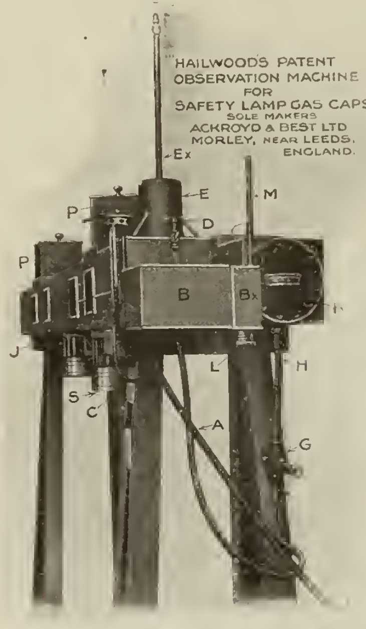



Fig 2.

scending through such apertures and diluting the lighter gas-mixture as it enters the lamp. The writer is of opinion that any lamp open to atmosphere, or any observation apparatus open to atmosphere, in the vicinity of the lamp, is subject to eddy currents or dilutions, generally to an unknown extent.

Both the drum and the gallery types are calibrated in such a manner that when using town gas allowance is made for the non-combustible gases generally present in such.

By experiment the writer hopes to show that, so far as the visible effect on the flame is concerned, the gas-caps of equal percentages of town gas and air, and of fire-damp and air, are to all intents and purposes identical, and that whereas town gas usually contains some gases of high illuminating power, these, so far as gas-caps are concerned, are nullified or balanced by the lower illuminating power of the comparatively high percentage of hydrogen usually present, as compared with fire-damp. This, the writer thinks, proves the error of recent arguments that it was wrong to employ town gas as a substitute for fire-damp in flame gas-cap testing by firemen. Town gas might give different results to fire-damp when platinum detectors, as in the Holmes Ralph gas-detecting portable electric lamp,* are employed, but there seems to be practically no difference in the effect on a flame-lamp.

The following are descriptions of the two types of apparatus:

### The Drum-Type.

This type (Fig. 1) consists of a large drum, A, to which is attached a measuring drum, B, and an observation chamber for holding the lamp, which stands in a water-ring seal, so arranged that the pricker can be operated from the outside.

The machine is adapted for use with either ordinary town gas or with cylinders of compressed gas, and will, it is thought, prove of great utility at collieries which are not supplied with the former.

The mode of operation is as follows:

Tap C is opened and the measuring chamber, B, filled with water. The gas tap, D, being now opened, the water is allowed to escape from the measuring chamber, B, by means of the tap, J, gas entering and taking its place, water to the level of the zero mark being left to form a seal. The taps D and J are coupled together by a rod, M, to ensure their working in unison. The gas tap, D, should then be closed and tap E momentarily opened to allow any surplus gas in the measuring chamber, B, over and above atmospheric pressure, to escape.

Tap F in a pipe communicating between the measuring chamber, B, and the drum, A, is now opened, after which water is again allowed to enter the measururing drum, B, through the tap, C, until the level upon the water-gauge indicates that the desired quantity of gas has passed into the drum, A, which is normally full of air. The taps C and F are coupled together by a rod, K, to ensure their working in unison. Each division upon the water-gauge represents ½ per cent., so that to pass 1 per cent. of gas into the drum it is only necessary to allow sufficient water to enter the measuring drum, B, to cover two divisions of the scale; 1½ per cent., three divisions; 2 per cent., four divisions; and so on. To allow an equivalent quantity of air to escape from the drum, A, tap G is opened whilst gas is being driven in, and a handle, H, connected with a large mixer, is rotated from time to time to well blend the mixture.

To absorb any carbonic acid given off by the lamp a tray of caustic-soda or ordinary ground-lime may be placed in the drum, A, the lid, P, of which, resting in a water-ring seal, is detachable.

With this machine it is a simple matter to rapidly change from small percentages up to 5 per cent., at which the gas-cap reaches towards the top of the lamp gauze. If more than a 5 per cent. mixture is desired, it can readily be obtained by recharging the measuring chamber, B, with gas, and operating as already described.

In the observation chamber the lamp is accessible, and quite close to the eye of the observer. At very low percentages the gas-cap remains steady for 15 to 20 minutes, and at high percentages for a few minutes. An average of not more than 5 minutes for observations of each percentage is recommended, but if a longer period be desired larger chambers are made for this purpose.

*"The Holmes-Ralph Gas-detecting Portable Electric Lamp," by Geo. J. Ralph, Trans. Inst. M.E., 1911, vol. xlii, page 201.

Before using the apparatus care should be taken that the seals to the lid of the large drum and the lid of the lamp chamber are filled with water, as also the seal in which the lamp stands. The lamp seal may be filled through an aperture in the side of the observation chamber, but care should be taken to replace the screwed plug.

### The Gallery-Type.

In the gallery-type (Figs. 2 and 3) the fundamental function lies in the velocity created by a gas-flame in the chimney of the apparatus.

The apparatus takes the form of what might be called a horseshoe gallery, J, about 5 feet 9 inches in length from end to end, the front portion (one side of the horse-shoe) being arranged to receive a lamp or lamps immediately in the rear of a glass observation window or windows. The lamp or lamps may be of any usual pattern or size, and are placed under covers, P, the lower end of which rests in a water-ring seat. The pipe, A, carries town gas to an accumulation box, B, to one end of which in connected a water-gauge, N, by the pipe, C. A tube, D, provided with a cock, is also carried from the accumulation box to the chimney, E, terminating in a gas-jet pipe, Ex. A regulator-box, Bx, is attached to the side of the accumulator-box, B, a pipe from the top part of the latter passing down to the bottom of the former through a glycerine regulating cup, L. The regulator box, Bx, is provided with an overflow pipe, M, at the upper end of which the overflow gas may be ignited. A tube, F, conveys the gas at a regulated constant pressure, throgh a measuring-valve, G, and a tube, H, to the extremity of the rear portion of the gallery, which is also provided with regulatable air-supply holes, K. At intervals along the gallery gauze mixing plates are arranged.

To operate, town gas is allowed to enter the accumulator-box, B, through the pipe, A, the glycerine regulating cup, L, being screwed up or down until the water-gauge reads at the correct figure, this being dependent upon the size of the apparatus supplied; in one size the water-gauge reads at ½-inch difference of level. The measuring-valve, G, is now opened, the area of the valve port-hole exposed fixing the percentage of gas passing into the apparatus, a pointer on the valve indicating the various percentages, such as, say, 1½ per cent., 2 per cent., and so on, rising in ½ per cent. Gas-jet, Ex, in the chimney, E, is then ignited, thereby creating a natural draught in the gallery, which draws in the gas at a uniform velocity, through the pipe H, and air through the supply-holes, K. The mixture is well blended as it passes along the gallery by gauze mixture-baffles, and of course passes through the lamps standing in the gallery, before reaching the chimney, E.

With this apparatus, by the simple operation of measuring valve, G, it is possible to very quickly change the percentage from zero to the explosive point, and vice versa, and to check the skill of the student in reading caps.

The lamp-covers, P, which rest in water-ring seals, act as safety-valves in the event of an explosive mixture being ignited, and other similar, though smaller, covers are provided in the rear portion of the gallery as additional reliefs. Tubes can, if desired, be provided for the purpose of drawing samples from the gallery, in order to check and prove percentages.

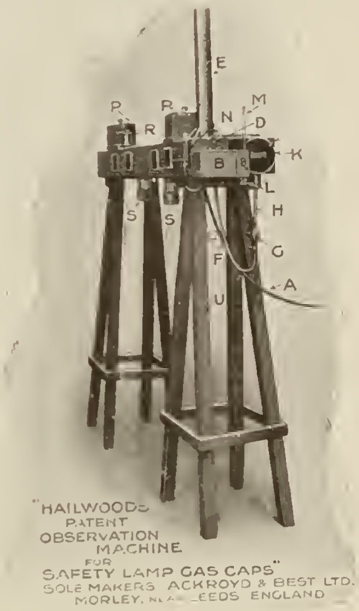



Fig. 3.

Amongst the advantages claimed for the gallery-type are the steady velocity of the mixture along the gallery, which conforms more to the conditions in an actual mine; the mixture arrives at the lamps in a thoroughly blended condition; and the lamps being completely enclosed are not so subject to eddy currents of gas, the caps therefore truly indicating the percentage of the mixture passing.

It is thought that an apparatus provided with a chimney, as in this, and so pulling the mixture past and through the lamps, gives an infinitely superior result to when the current is driven at the lamps. In the latter method the gas seems to advance in layers, waves or eddies, and when it reaches the lamp may not be thoroughly blended; therefore, lamps placed in different positions in the testing-chamber of such a machine may give varying unknown percentages, which do not correspond with the indicator.

Care should be taken to see that all the water ring seals are full of water or glycerine, and if rubber pipes are used to convey the gas that such hang free of kinks.

Fig. 2 illustrates the principal end of the apparatus, with the chimney, E, removed so as to expose the gas-jet pipe, Ex, while Fig. 3 shows the apparatus conveniently placed on trestles U.

# MINING IN BRITISH COLUMBIA

By E. Jacobs, Victoria, B.C.

Having been requested to prepare some notes on Mining in British Columbia for use as general information on an occasion when progress in the Province was to be reviewed, I supplied the following. It appears to me probable they will be of sufficient interest to warrant their being printed in The Canadian Mining Journal, so I submit them:

### Notes on Districts.

Taking the various mining districts of British Columbia in the order used in publications of the Provincial Department of Mines, progress is noted as follows:

**Cariboo.**—Mr. John Hopp and the Quesnelle Hydraulic Gold Mining Co., are both equipped for a big recovery of placer gold whenever conditions admit of long season's gravel washing.

**Cassiar.**—Mr. J. M. Ruffner, manager of North Columbia Gold Mining Co., estimates Atlin yield of placer gold in 1912 at $275,000 to $300,000. Official estimate placed recovery at $250,000. New discovery of gold in benches of O'Donnell River and others in creeks south of Teslin Lake. It is stated that developments on the Engineer group show much rich quartz.

**Skeena.**—Hazelton district will probably soon ship ore now that the Grand Trunk Pacific Railway is open to Hazelton. The Granby Co. claims to have between 5,000,000 and 6,000,000 tons of ore developed at its Hidden Creek mines; diamond drilling indicates much more, probably as much again. The following is an excerpt from President's circular to shareholders under date Nov. 19, 1912: "The Board has authorized the completion of a 2000-ton smelter and power plant, and the work will proceed with all possible despatch, in the hope that we may be shipping copper from this property before the close of the year 1913. The final estimates are not all in, but it is believed that the smelter and town with its buildings and equipment can be completed, the power plant installed, and the development work kept up meanwhile by a total further expenditure of $2,000,000. This means about $900,000 in excess of the cash and copper now on hand."

**East Kootenay.**—The Consolidated Co. has acquired the Sullivan mine and 14 adjoining mineral claims. Most of the new development is being pushed ahead into new ground. When the company commenced operations in the Sullivan there was very little ore developed; now there is more than one year's supply at the present rate of output of 100 tons a day. Much new machinery, plant, and building here.

Kootenay Central railway is now open from Crows Nest line to Fort Steele; construction south from Golden and north from Fort Steele is in progress. This should lead to a resumption of lode-mining in the Windermere division.

**West Kootenay.**—Ainsworth Division—The Bluebell mine was worked nearly all 1912 after a year's idleness. The Consolidated Co. is now operating in old Ainsworth camp, so the outlook is better for the camp now that capital is available for development and equipment.

Extension of C.P.R. line from Bear Lake to Whitewater has induced Rotallack & Co. to continue mining at Whitewater mines.

**Slocan.**—Contsruction of railway from Three Forks to Bear Lake is most important to eastern part of Slocan division. Lucky Jim resumed shipment of zinc ore in the autumn. Rambler-Cariboo, which has much silver-lead ore developed, erected a concentrator alongside the railway and constructed an aerial tramway from mine down to mill, and comemnced milling in December. Will now be able to get some return for its extensive development (first deep-level development of importance in district) commenced in 1904 and concontinued ever since.

Deep-level development is in progress at the Payne and Slocan Star mines. At the Surprise, near Cody, good ore is being opened after several years' of difficult development work. The Noble Five is shipping after years of non-productiveness. Near Silverton there is the most productive and promising camp in Slocan, the Standard, Van-Roi, and Hewitt mines give much prominence of permanent profitableness. Standard has lately opened important ore bodies in addition to those previously being worked. At the Van-Roi during the year there was found new and valuable ore bodies. Hewitt (Silverton Mines, Ltd.), also made valuable finds and is now putting in modern concentrating plant to include an advanced flotation method for recovery of zinc as well as other saleable contents of ore.

**Nelson.**—The British Columbia Copper Co. is developing, under option of purchase, the Eureka copper mine, and has bought outright the Queen Victoria copper mine; both are situated within a few miles of Nelson City. The Consolidated Co. has acquired a three-quarter interest in the Silver King and Dandy groups, near Nelson, and has commenced work there. These companies including Nelson district in their field of activities is one of the most important occurrences of the year connected with the mining industry there.

At Ymir. the Wilcox and Dundee are both developing encouragingly, and the Yankee Girl is being worked by a Spokane company in good financial standing.

At Salno, the Emerald lead mine is continuing productive. At Sheep Creek camp the Motherlode Company operated its new stamp mill during the latter half of the year, and the Queen had important developments in the deep of its mine, with large oreshoots opened.

**Rossland.**—An excerpt from Consolidated M. and S. Co.'s last annual report read thus: "Our Rossland mine show an increase in the amount of ore developed. with, we believe, a higher average value." The assistant general manager recently said: "The development in our Rossland mines has been very satisfactory, especially so in the lower levels where large bodies of ore of very good grade have been developed. The tonnage of developed ore is larger than it had been for some time past. and the grade is considerably better. The company has kept up its usual policy of doing very extensive development work." The manager of the Le Roi No. 2, Ltd., said: "Beside the discoveries of numerous ore bodies in the better-known veins in the upper ground, the most important development is that of an ore bdy on the 1650 (Le Roi) level. This is the deepest ore known in our ground and is of good metal content, size, and character, and augurs well for the future of this part of the property in depth. Development is in progress here."

Many changes and improvements were made at the Consolidated Co's smelting works and refinery at Trail, these making for the more expeditious and economical handling of materials, and better working conditions for the men employed in the works.

**Boundary.**—Output of ore in 1912 was in excess of 1,900,000 tons, as compared with 1,187,000 tons in 1911 and 1,654,000 tons in 1910. At the Granby mines, costs for the first six months of 1912 were at the rate of 74.4 cents a ton of ore mined (less than 75 cents). During five months, February-June inclusive, cost of smelting and converting into blister copper was $1.264. Together, cost of mining, smelting and converting was $2.008, or a small fraction more than $2 per ton of ore mined. Estimated ore in sight in Granby mines on July 1, 1912 (beginning of new fiscal year), 6,433,418 tons, or five years' supply working at full present capacity of smelting works.

**Similkameen.**—In 1912 the Hedley Gold Mining Co. crushed 70,000 tons of gold ore, recovered $762,718; made a profit of $407,505 for the year's work, and bought for $150,000 adjoining property on which a large body of ore of good grade was first found.

The British Columbia Copper Co. had more than 100 men working in and near Voigt's camp, ten miles from Princeton, practically all the year; it also employed six diamond drills. Negotiations for purchase of this property are being continued.

Railway has extended from Princeton to Coalmont, on Tulameen River.

Promising new silver-lead camp has been opened at Summit, in Tulameen district.

**Nicola Valley.**—The Nicola Valley Coal and Coke Co. found a new seam of coal and proved that its other coal deposits are extensive. Railway building is active in district.

**Lillooet.**—Developments in quartz mines are most promising. Railway building is active in district.

**Coast.**—The Britannia Mining & Smelting Co. mined 193,000 tons ore and recovered between 14,000,000 and 14,500,000 lbs. of copper. It has bought much surrounding property; is doing much underground development work; providing extensive power and transportation facilities, installing modern concentration plant, and employing 600 to 700 men. There is here every indication of the permanent establishment of an important copper-mining industry within 30 miles water distance of the City of Vancouver.

The Marble Bay mine, Texada island, is now being developed at thirteenth level, 1,160 ft. deep. It has added to its waterfront shipping facilities during the year—it now has capacity for shipping 1000 tons daily. It has put in new plant and had up to 120 men employed.

Negotiations for purchase of the big iron deposits on Texada Island are still being carried on.

**Vancouver Island.**—No metalliferous mining of importance was done in 1912. Three new coal mines are being opened—one by the Pacific Coast Coal Mines, Ltd., between South Wellington and Boat harbour; one by the Western Fuel Co. at mouth of the Nanaimo River; and one in the Comox district by the Canadian Collieries (Dunsmuir) Limited. All should be mining coal before the close of 1913. The Pacific Coast Coal Mines, Ltd., is also continuing development of Suquash a practically new mine. The Can. Colls is developing a hydro-electric power system and constructing a new railway in Comox district. It will probably put in coal briquetting plant there shortly.

**Miscellaneous.**

There is a much enlarged demand for structural materials—building stone, lime, cement, clay products, etc.

The Provincial Mineralogist gives the year's values as $4,450,000.

**Summary of Dividends Paid in 1912.**

| | | Rate per annum. |
|---|---|---|
| British Columbia Copper Co. ,Ltd. | $177,512.70 | 6% |
| Consolidated Mining and Smelting Co. | 232,208.00 | 4 |
| Hedley Gold Mining Co. | 360,000.00 | 30 |
| Le Roi No. 2, Ltd. (1s. a share on 120,000 shares) | 29,400.00 | 1 |
| Standard Silver-Lead Mining Co., Ltd. | 425,000.00 | 21¼ |
| Total for year of distributed profits | $1,224,120.70 | |
| B. C. Copper Co's dividend declared in December, but payable January 15, 1913 | 88,756.35 | |
| Granby Consolidated Co.'s profits, aproximately | 1,500,000.00 | |
| Total | $2,812,877.05 | |

The president of the Granby Co. stated at the annual meeting that the company's net profits for the first half of the year had been nearly $600,000. In the second half, the company announced that profits had been about $140,000 a month. As it was generally understood that for November and December profits were higher, it seems fair to place Granby Co.'s net earnings for the calendar year at $1,500,000. Then there were known net earnings of other companies apart from dividend distributions, so that the net profits of metalliferous mining companies for 1912 were probably $3,500,000, in addition to which one or two of the coal mining companies also made profits.

# BRITISH COLUMBIA COPPER COMPANY

By E. Jacobs, Victoria, B. C.

The British Columbia Copper Co., Ltd., had a full year of mining and smelting activity in 1912. Its operations were profitable, too, for it paid two dividends—Nos. 4 and 5—each of 15 cents a share on its 596,709 issued shares, making a total distribution for the year of $177,512.70, and in December dividend No. 6, at a similar rate, was declared payable on January 15, 1913. Including the last mentioned, the aggregate of dividends paid by the company is $615,399.88.

Exact figures for December have not been received, but including an estimate for that month, the following shows the ore receipts at the company's smeltery at Greenwood from its own mines: Mother Lode, 384,190 tons; Rawhide, 267,349 tons; Wellington Group mines (3), 11,055 tons; Emma, 4,436 tons; Queen Victoria, 1,066 tons; Lone Star and Washington (U. S.), 1,946 tons; Napoleon (U. S.), 17,214 tons; total 687,256 tons. The metals recovered from these ores were: Gold, 25,643 oz.; silver, 141,222 ozs.; copper, 11,267,681 lbs.

Some notes of the company's mining operations last year follow:

**Mother Lode Mine.**

At this mine, from which more than 2,500,000 tons of ore has been mined in all years to date, operations throughout 1912 were practically nothing but ordinary mining. For the most part this consisted of drilling in advance of breaking down pillars and benches of ore, and this drilling was kept far in advance of ore-breaking requirements, preparatory to blasting with electric-fired charges. The method followed was to drill and load from 1,500 to 2,500 holes, averaging about 12 ft. in depth, connecting them up in groups of twenty-five to a group. All were provided with electric fuses, and fired simultaneously. Each of these blasts broke down many thousands of tons of ore, in some cases enough to last for shipping over several months. The average number of men employed at the mine the year through was between 100 and 110, working six days a week for about half the year, and seven days the other half. There were not any important additions to machinery, plant, nor buildings in 1912, the existing general equipment having been sufficient for all needs. The power plant was operated chiefly by electricity—the big hoist by compressed air, and the compressor by electricity, with auxiliary steam when required.

### Other Boundary District Properties.

The Emma mine, in which the company holds a three-fourths interest, was worked only in January and February, for the power plant at this mine was badly damaged—almost destroyed—by fire on February 27th, since which date the mine has been idle.

The Wellington Group mines were worked until June, when they were closed, and nothing more was done on them afterward. The company plans to do considerable exploratory work on this property next season.

### Mines in Washington.

The company owns two mines in the neighbouring State of Washington, namely, the Lone Star and Napoleon.

The Lone Star is situated immediately south of the International Boundary, and is connected with the Canadian Pacific Railway near Boundary Falls, three miles from the company's smelting works, by an aerial tramway five and a half miles long. Notwithstanding that this tramway crosses three mountain summits, it has been operated successfully from the time a commencement was made to convey ore over it.

The Lone Star was worked only during a part of the year. Owing to its high silica content it was eventually deemed inadvisable to endeavour to smelt the ore from this mine with that from the company's other mines. For some time past concentration tests have been carried out with the object of determining how best to eliminate the excess of silica. The ore presents somewhat unusual resistance to concentration, but notwithstanding this, the problem is now in a fair way toward being successfully solved. There is in this mine a large quantity of ore available, so the results of endeavors to make it suitable for smelting will have an important bearing upon the question of ore supply for the company's smelting works. In value the general tenor of the ore is higher than that of the average Boundary ores.

The Napoleon mine has worked practically all the year. The sulphide ore was sent to the smelting works at Greenwood, while the oxide ore was milled at the company's concentrating mill situated near the mine. The sulphide ore from the Napoleon is used at the smelting works, on account of its sulphur content, to regulate the grade of the copper matte. It is not, however, a barren flux, for it contains copper, gold, and silver in considerable quantity.

### Operations in Kootenay District, B.C.

The company's mining operations in Kootenay district are under the general charge of Mr. H. Johns, superintendent in Kootenay.

The first property the company took under bond was the L. H. group, situated about six miles southeast of Silverton, Slocan Lake. Development work was commenced here in the latter part of 1911 and continued through the winter until February, 1912, when the snow was too deep to allow of communications being kept open, and conditions generally were unfavorable for work, so nothing was done for four or five months. In July exploratory work was resumed with eleven men employed, and to date results have been, on the whole, fairly satisfactory. Two levels are being opened, these being about 90 ft. apart in vertical depth. The ore has a very siliceous gangue and contains little economic mineral other than gold, which is in iron and associated arsenical sulphide. Concentration before smelting will be necessary, to get rid of the excess of silicia. The upper workings are at an altitude of about 5,600 feet above sea-level and approximately 3,840 feet above Slocan Lake. The Provincial Government granted an appropriation towards the cost of building a wagon road a distance of, roughly, three and three-quarter miles, to connect with an existing wagon road from Silverton southward, and this work has been finished to within 2,000 feet of the mine, when snow fell and compelled completion to be deferred until next season.

The Eureka, which was bonded at the end of last July, is situated about nine miles from the city of Nelson, and ever since then up to 25 men have been employed at this mine, doing development work. The ore contains copper, gold and silver, in a gangue of altered limestone. Buildings have been erected for the accommodation of the men, and a route surveyed for an aerial tramway from a proposed new tunnel site to the Canadian Pacific Railway across Kootenay River, a distance of about 12,000 feet. The construction of the tramway, however, will not be commenced before next spring.

The Queen Victoria group, near Beasley siding, on the north side of Kootenay River and about nine miles west of Nelson, was acquired by purchase at the beginning of November. This mine is fully equipped for operation, having all requisite mine buildings, water supply, electric-driven compressor, and an aerial tramway down to the Canadian Pacific Railway below. The development work done by previous operators consist chiefly of three adits from which raises have been made to the ore, which is an altered lime, similar in general character to the prevailing copper ore of Boundary District. About a dozen men were set to work in November, and the number increased as matters became favorable for employment of a larger number. Arrangements have been made for transportation of the ore over the Canadian Pacific Railway to the company's smeltery at Greenwood. It was intended to ship from 500 to 1,000 tons a week; the quantity is dependent upon the capacity of the aerial tramway, which was not known when these particulars were obtained.

### Voigt's Camp, Similkameen.

Two groups of mineral claims, situated about ten miles south of Princeton, east of Similkameen River, and along Wolf Creek, were being developed by the company under option of purchase. The larger of these, known as Voigt's group, comprises 55 claims and fractions; the smaller, known to the company's officials as the "upper camp," includes the Ada B group and several individual claims, eight in all. Development work was commenced by the company on these properties in October, 1911, and was vigorously carried on until late in 1912.

A great deal of exploratory hand work was done on the Voigt group, and much diamond-drilling as well. Commencing with 16 men and two diamond drills, op-

Courtesy of R. P. Rogers, Esq., Manager Coniagas Mine.

**2nd LEVEL CONIAGAS MINE—SHOWING PILLARS**

(NOTE THREAD OF LIGHT FROM MOVING CANDLE ON LEFT.)

erations were enlarged until six drills were in use and upwards of 60 men employed. In addition to doing about 1,500 feet of underground hand work—cross-cutting, drifting and shaft-sinking—and many thousand feet of diamond drilling, several thousand feet of surface trenching was done. As yet no information is available for publication relative to results of this work, for at the time of writing no statement had been made public as to whether or not the company will make a comparatively large payment on the bond that was due in December.. Judging by the statements of those who have for years been engaged in prospecting on the Voight property, there are large showings of ore on various parts of this big group of claims, and it is hoped that the company will have found the ore deposit big enough and of sufficiently good average grade to warrant it in taking up its bond.

The "upper camp" adjoins the Voigt group on the south The underground development work done consists of some 700 feet of shaft-sinking, cross-cutting, and drifting, while fully 1,500 feet of diamond-drilling has also been done. On the surface, several thousand feet of trenching has been part of the exploratory work. There were in November two diamond drills being used and the working force included in all, about 30 men.

The ore met with in this camp varies as a whole, from heavy hematite containing copper and iron sulphides with gold and silver, which ore is base, to ore containing a high percentage of silica with similar economic minerals. The geology of the camp has not yet been thoroughly worked out, but as a rule the tendency of mineralization is along fracture zones extending in a general direction from the southwest toward the northeast, the surface mineralization being extensive. Details concerning the ore bodies, however, are not yet made known.

The company erected in the lower camp numerous temporary buildings, while in the upper camp a substantial bunk and boarding house has been built. The plant put in included one 80-h.p. steam boiler connected to two 3-drill compressors, half a dozen small boilers for operating diamond drills, small hoists, etc., and pumps, piping, tram rails and cars, and all other equipment requisite for doing the work that has for months been in hand. Part of the diamond drill plant is owned by the company, and the remainder by contractors, the drilling being done by contract.

### New Dominion Copper Co.'s Mines.

The British Columbia Copper Co. holds a controlling interest in the New Dominion Copper Company, which owns several mines in Boundary district. The only one of these mines that has been operated on a large scale last year was the Rawhide, situated near Phoenix. Work was continued all the year, and much development—new adits and raises, chiefly—was done, besides which a large quantity of ore was mined and shipped to the company's smelting works at Greenwood.

Included in the new work was a branch of the lower tunnel, connecting with the ore-shipping bins. An electric haulage system was put in, to take the place of hauling with horses. The footage of development work done in 1912, including an estimate for November and December, is placed at 2,656 feet, some 2,116 feet of raises and drifts to October 31, and 540 feet estimated for the two remaining months.

# COBALT AND ADJACENT AREAS

By Willet G. Miller.*

The invitation of the editor to write a short paper on Cobalt for this review number of the Journal has been accepted not because I feel that I can add anything new to the description of the silver areas, but because I am willing to try to assist in the review. Stocktaking is valuable. A consideration of the successes and failures of the past, together with a description of present conditions, should be of service in planning for the future. While I have not the time, even had I the inclination, to attempt a systematic review, other writers in this number will doubtless have rendered it unnecessary.**

### Production and Extent of Territory.

Cobalt proper, or the area about six miles in extent in the township of Coleman, has produced approximately 154,000,000 ounces of silver since the end of 1904. When, however, it is considered that the geology of this area is similar to that of numerous other areas, in several of which either cobalt, or cobalt and silver, have been found, it may reasonably be expected that in a region approximately 5,000 square miles in extent, important discoveries will be made in localities that at present are unproductive. The success that has been met with in Casey, South Lorrain, and Gowganda will encourage more systematic and intensive work in other areas than has hitherto been performed.

Characteristic cobalt ores have been found as far south as Rabbit Lake, which lies south-east of Temagami, as far north as Wendigo Lake to the north of Casey, as far north-west as the township of Langmuir south-west of Porcupine, and as far west as Shining Tree. Surely within this region, productive areas, as yet undiscovered, will be developed!

In the earlier years of prospecting and mining at Cobalt it was the rule to look for quick returns, either from mining rich ore or in selling properties. Much territory, for instance, lying on either side of the line between Cobalt and Elk Lake, had little systematic work done on it. It contains many six-mile areas that cannot be said to be barren. The same can be said of other non-productive areas in the 5,000 square mile region.

### Structural Relations.

Whatever may be thought of its being helpful in theology, dogmatism should have small place in the natural and physical sciences. Hence, in the papers and reports I have written on Cobalt I have tried to avoid being dogmatic. I have not felt, for instance, that all is known concerning the origin of the cobalt-silver ores. Indeed, the more I see of the cobalt and certain other ore deposits, the less reason there is, it seems to me, for any person being dogmatic concerning the origin. If there is anything more complex than the origin of certain ore deposits it probably is only animated nature. We can never hope to know much concerning the interior of the earth, or even of

*Ontario Provincial Geologist. **The wording in this paragraph, and the general character of the paper, are due to the paper having been written with the object of using it as an introduction to a review number of the Journal.

that part of it two or three miles below the surface. We may dogmatize and propose attractive theories and hypotheses, but we have few facts and are almost helpless when it comes to the consideration of the effects of combination of causes that are represented by certain ore deposits. Superman may solve the riddle!

While we may not claim to know all about the origin of the ores at Cobalt, there are certain facts and inferences therefrom that are helpful at least in a utilitarian sense. We know, for instance, that in every area in which cobalt or cobalt-silver ores have been found throughout the 5,000 square mile region, the Nipissing diabase is present. Hence we can conclude that this diabase played an important part in connection with the origin of the ores. Whether, however, the impure waters that accompanied and followed the diabase intrusion and deposited their metallic contents in the cracks and fissures, giving rise to the veins, received all of their contained metals from the diabase magma, or whether some of the metals were derived from rocks through which the diabase was intruded is conjectural. Then the normal order of the deposition of the various ores in the veins is fairly well known. But too hard and fast lines should not be drawn. Moreover, because native silver in certain deposits in other parts of the world can be proved to be of secondary origin, resulting from the decomposition of ores or minerals, it should not be said without reservation that all the native silver at Cobalt is of such secondary origin. From observation on a few veins it should not be said that physical-chemical influence of the country rock played an important part in ore deposition. Nor should it be said, of areas in which Nipissing diabase is present or has been removed by erosion, that veins will not be found in certain rocks. In the notes accompanying the first map published of the Cobalt area prospectors were advised to give special attention to the conglomerate. This did not mean that no veins were likely to be found in the diabase or Keewatin, but that veins were likely to be much more numerous in the conglomerate. Prospecting and mining during the last eight years have proved this early advice to have been sound, over eighty per cent. of the production having come from the conglomerate.

### Geological History.

The "great stone book", the crust of the earth, especially if a restricted area or district on the surface of the globe is considered, has been compared to a volume in which pages and even chapters are missing. It is well, we may repeat, not to be dogmatic and affirm that the complete geological history of any area is known. What author has been able to write a history of a people that is complete? Characteristics of an age, or of a people, may have been preserved in the writings of certain contemporary authors that may afford the later historian material for a true account of a limited period. But the data on other ages or periods are incomplete. Similarly in working out geological history, data are sometimes discovered that make the history of restricted periods clear and distinct. An unconformity or a good contact may throw as much light on the physical history of a period as does, for instance, Pepys' diary on a period of British history. But such contacts or diaries or other records are not always available, and the complete history cannot be written.

At Cobalt and in the surrounding region data are found that make clear part of the complex geological

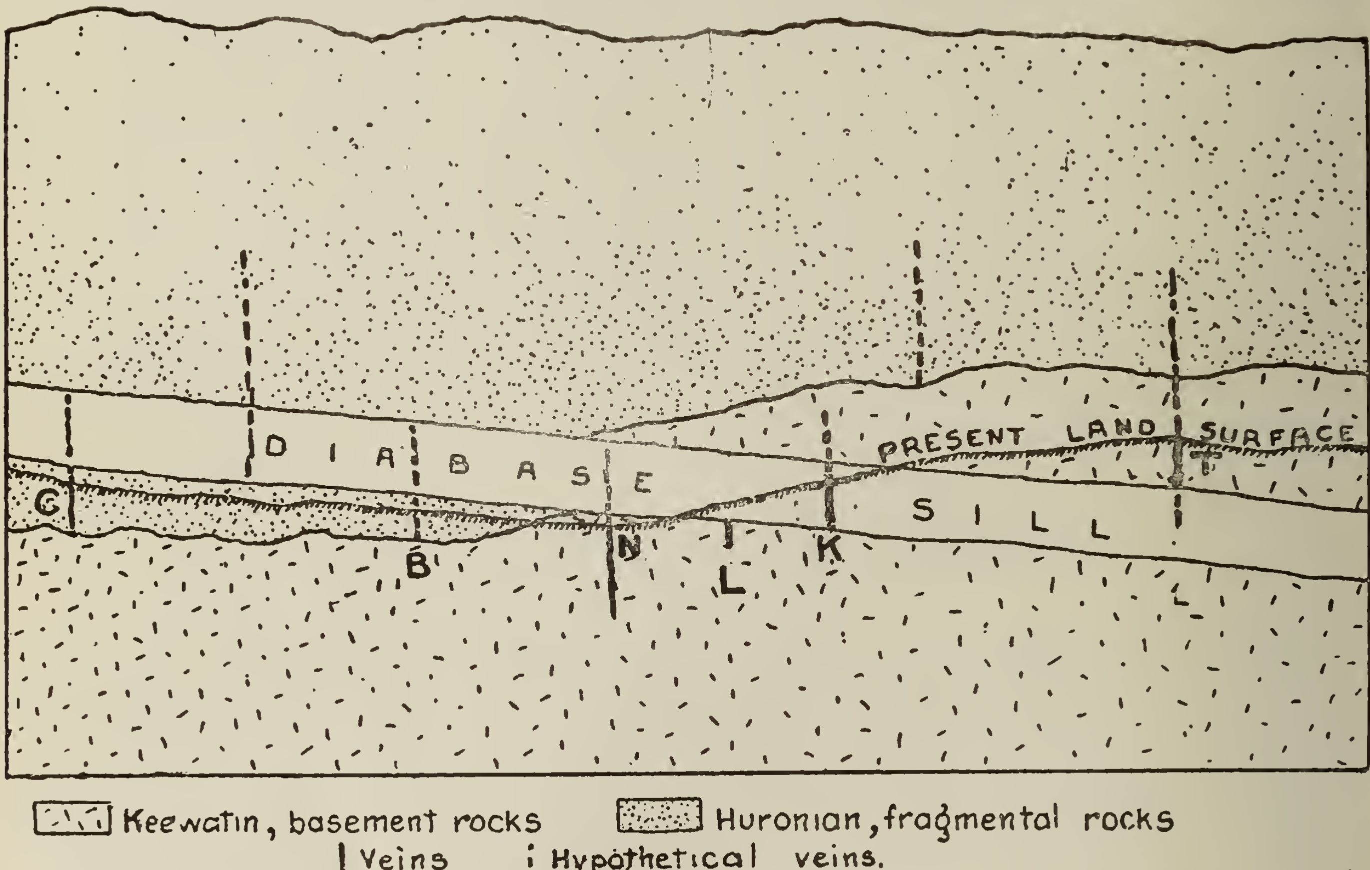



Fig. 1.
CROSS-SECTION, IDEAL RESTORATION OF ROCKS AND VIEWS AT COBALT.

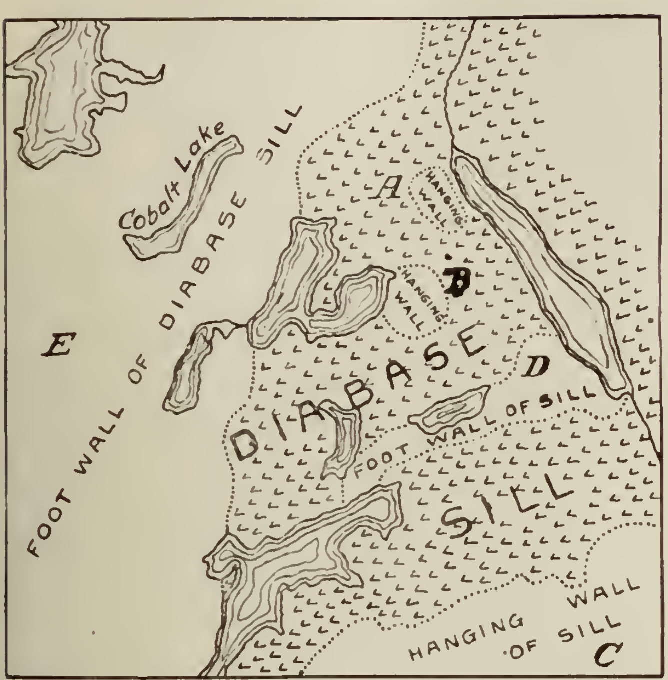



Fig. 2.

history. While a complete history of the pre-Cambrian period, to which the rocks of Cobalt belong, may never be written, enough is known to be of value for economic purposes.

In the productive Cobalt area there are three great groups of rocks, each representing an important epoch in the history of the region, that are of interest from the miner's point of view. These are from the youngest to the oldest: (1) The Nipissing diabase; (2) Cobalt conglomerate and other fragmental rocks, and (3) the Keewatin complex of essentially volcanic rocks, with a minor quantity of sedimentary material.

The accompanying generalized cross-section of the Cobalt area shows the relationship of these three groups of rocks, and characteristic modes of occurrence of the veins, (Fig. 1).

The Cobalt conglomerate and associated fragmental material are the erosion products from the Keewatin and other early series of rocks of the district. The Nipissing diabase has intruded both the Keewatin and Cobalt series. It is believed that the cracks and fissures now occupied by the cobalt silver veins were formed on the cooling and contraction of the diabase. The vein minerals or ores are believed to have been deposited, as already said, from the impure waters that accompanied or followed the diabase intrusion. The parts played respectively by meteoric and what are called magmatic waters are conjectural.

The diabase, as is well known, is in the form of a great, almost horizontal sheet, or sill. Its upper wall, consisting of rocks both of the Cobalt series and of the Keewatin, has now for the most part, in the productive area at Cobalt proper, been removed. (Fig. 2). The veins in the conglomerate are in the foot wall of the sill. There are some veins in the Keewatin foot wall (Fig. 1), and in the sill itself, while two or three are in the Keewatin of the remnant of the upper or hanging wall.

## Faults.

As in many other mineral areas, faults are important features in the Cobalt area. The one which passes through the workings of La Rose mine south-west through Cobalt Lake, and the McKinley-Darragh mine is the best known, the mine workings along and on either side of it having afforded facilities for study. Fig. 3, from a cross-section by Mr. Cyril W. Knight, shows the structure at LaRose mine. Faults such as this have brought about the preservation of veins, or

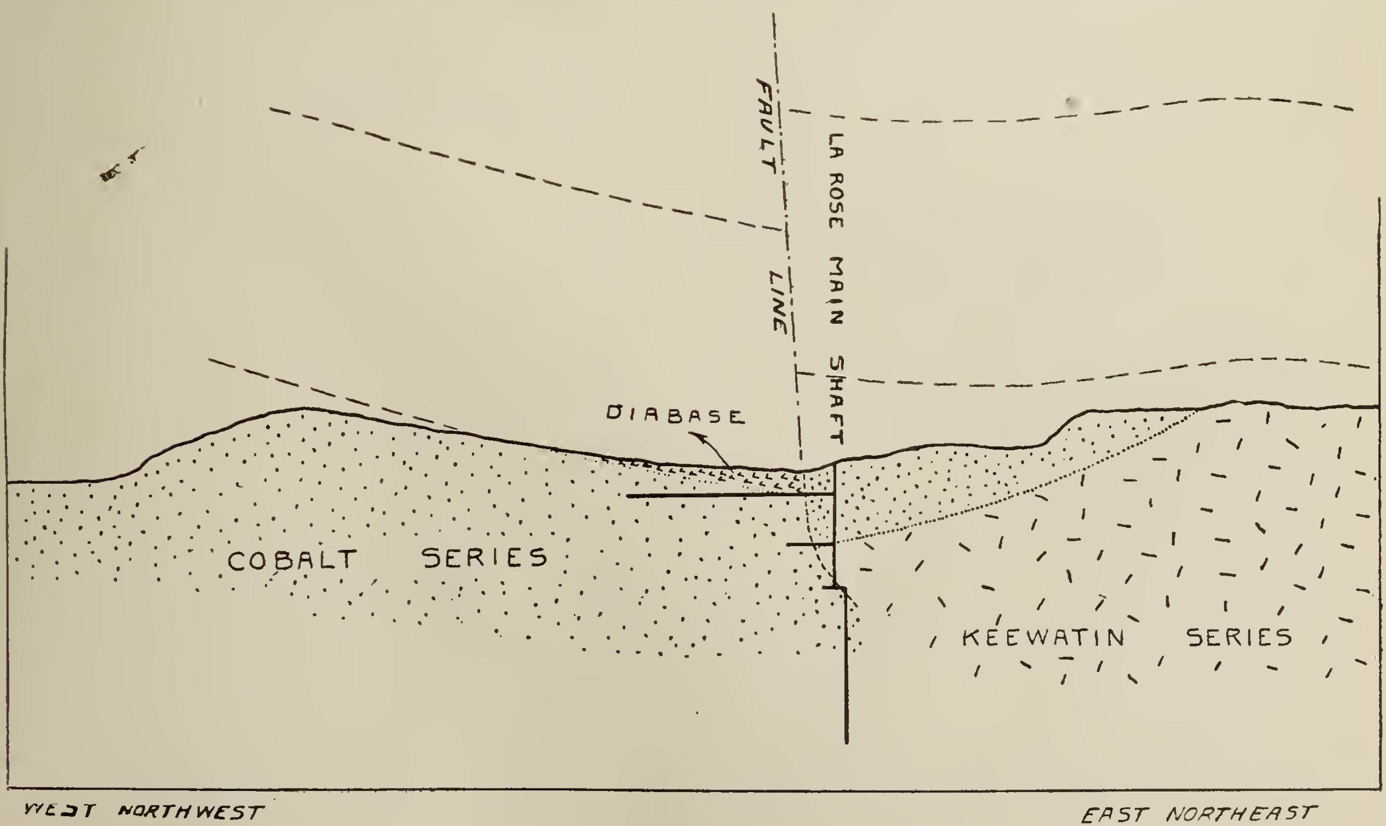



Fig. 3.

parts of veins, that otherwise would have been removed by erosion. It is probable, as I have said in another paper, that a great fault extending through Lake Temiskaming accounts for the absence of productive silver veins on the east side of the lake.

Owing to the economic importance of faults at Cobalt, careful search for similar structures, in other mineral areas of Northern Ontario, should be made. While, for instance, certain gold deposits that have been worked in years past in Ontario have been found to have no great depth, it is possible that in other areas, owing to faulting, parts of veins have been carried down and preserved from erosion, thus affording much larger workable deposits.

# PERSONAL AND GENERAL

Mr. R. J. Flaherty has returned to Toronto from Port Arthur.

Mr. J. B. Tyrrell returned from London last week. During his visit to England he examined several mines in Cornwall and elsewhere.

Mr. W. E. Segsworth was in Toronto on the 22nd and 23rd ultimo.

Messrs. W. F. Stanley & Co., Ltd., manufacturers of surveying and mathematical instruments, have taken new office accommodation at 286 High Holborn, London, Eng. They still retain the old premises at 4-5 Great Turnstile.

Mr. Robert Bryce is in Cobalt.

Mr. Geo. F. McNaughton, late manager of the Trethewey mine, Cobalt, is in Nova Scotia.

Mr. G. G. S. Lindsey spoke before the Toronto Branch of the C. M. I. on the 18th of January, an account of his speech will be found on another page.

Mr. Melbourne Bailey, manager of Mr. John Hopp's several hydraulic placer-gold mines in Cariboo district, B.C., is spending the winter at his home in Tacoma, Washington.

Mr. Wm. Blakemore, of Victoria, B.C., in the course of evidence he recently gave at a sitting of the British Columbia Labour Commission, after speaking strongly in favour of Trades Unionism, expressed the opinion that ther was little or no cause for the existing strike of Union coal miners at the mines of the Canadian Collieries (Dunsmuir). Limited, Vancouver Island.

Mr. S. G. Blaylock, of Trail, B.C., assistant general manager, has been one of the chief spokesmen for the mine owners of Kootenay before the Board of Investigation and Conciliation appointed in connection with the demand of metalliferous miners for an advance in wages at mines in that district.

Mr. J. W. Bryant, formerly chief mining engineer for the Tyee Copper Co., Ltd., when that company's mining activities were important in the Pacific coast districts of British Columbia and Alaska, recently contributed to The Mining Magazine, London, an article on "A New Copper District," in which information is given concerning Rainy Hollow district, in the extreme north-western part of British Columbia.

Mr. C. Victor Brennan (B.Sc., McGill, 1908), of Bingham, Utah, chief mining engineer for the Utah Consolidated Mining Co., on January 7 married, at Vancouver, B.C., Miss Alice Graeme McMynn, daughter of Mr. Wm. Graham McMynn, for years Gold Commissioner at Greenwood, B.C. Mr. and Mrs. Brennan will have their home at Bingham.

Following Mr. Herbert Carmichael's voluntary retirement from the positon of Provincial Assayer for British Columbia, Mr. Wm. Fleet Robertson, Provincial Mineralogist, has added the direct charge of the Provincial Assay Office to his other duties. The Assistant Assayer, Mr. D. E. Whitaker, will continue to give the whole of his time and attention to the assaying and analytical work of the office.

Mr. Kenneth B. Carruthers (B.Sc., McGill, 1908) is in charge of the Molly Gibson silver-lead mine, in Nelson mining divison, British Columbia, for the Consolidated Mining and Smelting Company of Canada, Ltd.

Mr. A. F. Eastman, manger of the mining department of the Tacoma Steel Co., which owns the Marble Bay copper-gold mine at Van Anda, Texada Island, B.C.; was taken seriously ill at the mine early in December. Later he was removed to his home at Tacoma, Puget Sound, Washington. After about five weeks' illness, he is convalescent.

Mr. Thos. Gough, manager of the Kootenay Gold Mines, Ltd., operating the Granite-Poorman gold mines and 20-stamp mill near Nelson, B.C., has been in Victoria on a short business visit.

Mr. Alexander Grant, for a number of years manger of the Marble Bay mine. Texada Island, B.C., both when it was owned by Messrs. Christie and Palmer, of Toronto, and after its sale to the Tacoma Steel Co., is spending the winter at San Diego, California.

A Boundary district newspaper states that Mr. E. Hibbert, superintendent of mines for the British Columbia Copper Co., is about to leave British Columbia to take charge of a mine near Sudbury, Ontario.

Mr. Robert R. Hedley has during recent months been active in promoting the interests of the Chamber of Mines, of Vancouver, B.C., of which institution he is chairman.

Mr. John Kirkup, for years Gold Commissioner for the Trail Creek mining division, with headquarters at Rossland, B.C., has been transferred to Alberni, Vancouver Island, the Provincial Government having acceded to his wish that he be given an appointment on the Coast. He is now Government Agent at Alberni.

Mr. Andrew G. Larson has returned to Vancouver, B.C., from a trip to Colorado and Montana.

Mr. Thomas Kiddie is now resident at West Alhambra, California, the state of his wife's health necessitating a change from the colder winter climate of British Columbia.

Mr. J. W. D. Moodie, vice-president and general manager of the Britannia Mining and Smelting Co., has returned from a trip to New York and other eastern parts, and is now continuing the active direction of the important developments underground, and additons to power, transportation, and ore-concentration facilities in connection with the Britannia copper mine. Betw[illegible] 600 and 700 men are employed by the company, which in 1912 increased its output of ore by nearly 100 per cent. (to 193,000 tons) as compared with its 1911 output.

# MINING INVESTMENTS

(Written by a Mining Accountant.)

Preliminary.

What are the prospects as regards the payment of a fair rate of interest and the ultimate return of capital, and what are the risks? are the two vital questions which should be satisfactorily answered before entering into any mining investment.

Unfortunately, the average investor does not possess the necessary knowledge of mining or the experience in mining investments to enable him to size up or review all the demerits usually so much in evidence with this, the most hazardous of all investments; and, moreover, except in cases where the mine has been sufficiently developed, even a mining engineer would not be justified in arriving at any definite conclusion regarding the possibilities ahead of the mine.

That it is possible, however, to draw a line of demarcation between what might be termed "a fairly sound investment with reasonable prospects of success," or "a rank gamble," cannot be denied; otherwise this article would not have been written in the best interests of those who, as a result of inexperience, are apt to invest their money where the prospects of the return of capital, let alone the payment of a fair rate of interest, appear anything but favourable when denuded of the glowing reports and misrepresentations which are sometimes made in good faith, but more often as a lever for unscupulous promotions.

Investments in mining stocks at par or before the mine has reached the producing stage, while offering the chance of realizing larger profits, must, for obvious reasons, be more or less of a gamble, but in cases where the mine has been reported on by a reliable engineer and systematic sampling of the surface showings reveals a continuity of payable values over an appreciable length and width, and the indications are such as to justify expert contention that the pay shoot will not diminish in legth, width, and value at depth, the acquirement of an interest in the mine can justly be considered a fairly sound investment, if it has not been over-capitalized, or, in other words, the surface indications or showings will obtain at depth, it appears evident that a large enough tonnage can be mined and treated to show a return of 20 per cent. per annum on the original capital.

If, on the other hand, however, the mine has not been sufficiently developed to justify a definite expression of opinion by a reliable engineer as regards its possibilities as a dividend earner, then the mine is still in the prospecting stage and intending investors would do well not to participate in any floatation in connection therewith, unless they are looking for the very worst kind of a gamble where the chances as evidenced by the formidable array of "wild cats" are less than those on the race course, and that, even to those who know as much about a horse as a cow does about a side pocket.

Apart from the necessary assurance on these salient points, intending investors should also satisfy themselves that the flotation involves men of high standing, who, as promoters, consulting engineers, and directors, cannot afford to risk their reputation by statements which cannot be theoretically or practically demonstrated, that the concern has not been over-capitalized, and that the working capital is sufficient to develop and bring the mine through to the producing stage, and does not indicate that either the purchase price is considerably in excess of the actual value of the property, or that the promoters' profits are unusually excessive.

A careful perusal of the memorandum and articles of association or by-laws, is also advisable, as the answering of such questions as: What are the directors' fees? How many shares must the directors hold to qualify? and what are their powers, etc., etc.? often expose conditions which are anything but favourable in the best interests of the shareholders.

A great deal more could be said on this very knotty question of sizing up the merits or demerits of mining propositions in their nifancy. This, however, when dealing with the geological conditions, favourable or otherwise, to gold deposits with permanency at depth, the evils of mismanagement, and unfavourable working conditions, etc., etc., would be unintelligible except to those having the necessary technical knowledge and experience. Moreover, that which has already been written is sufficient in itself to make it apparent that without instituting rigid inquiries and obtaining expert opinion as regards the possibilities ahead of the mine investors when relying solely on the statements of the promoters and stock vendors, are incurring risks, which, when brought to light, would cause even the most reskless speculator to fight shy of the venture.

It naturally follows that by only entertaining propositions where the risks are apparently reduced within reason, the opening up of the mineral resources of the country would be seriously retarded by such cautious proceedings. This, however, outside of the common loss thereby sustained by each and every member of the community, does not effect the individual, and is, therefore, beside the question, especially as the consistent turning down of everything in which the element of speculation predominates, would gradually force promoters to realize that without risking something to develop the mine to the point of establishing its position as a dividend earner, their chances of realizing the enormous profits (at present usually out of all proportion to the outlay) are as remote as those which under existing conditions, the average shareholder is expected to carry.

The foregoing deals with the acquirement of shares in any mining company at its inception, and although the risks are in proportion to the prospective gains, this, for reasons set out herein, appears the most favourable period in the life of the mine to become interested therein.

For example, let it be assumed that a company capitalized at $600,000, showed a profit of $200,000 over all charges, including plant depreciation and development redemption as a result of operations during the first year after reaching the producing stage, and that the positive ore reserves were such as to assure a similar profit for a further period of four years. Now, under the present methods this profit would be paid out in the form of a dividend representing 33 1/3 per cent. on the par value of the shares which, everything being favourable, would then rise in consequence until returning, say, 15 per cent. when maintaining this profit. This would represent a sound investment if the life of the mine and similar profits were assured for twenty years, but in view of the possibilities as regards the pay shoots not continuing at depth, etc., etc., it certainly could not be considered safe with only four years' ore in sight, to take such an extremely optimistic view. As a matter of fact, it would be somewhat risky to double the prospects as revealed by the actual ore in sight, or, in other words, figure on the profits being maintained for eight instead of four years. Even then the shares would not be worth their par value with only the return of capital and 2½ per cent. interest per annum reasonably assured.

This now brings us to the question of inflated stock values, and it does not require much figuring to show that the shares, when standing at a price returning only 15 per cent. on the annual profit of $200,000, would be more than double their actual value and that, whereas, when taking the precautions referred to herein, the investment at par offers a good fighting chance, the purchasing of shares as an investment after payment of the first dividend, is very much more of a gamble, as there is then no doubt that on such an inflated valuation the mine is very much over-capitalized on the showings, even when making very liberal speculations thereon in the manner suggested. The undeniable fact that it needs to be a very good mine, indeed, which after ten years, let alone twenty years, does not at least reveal conditions necessitating a reduction in the grade of ore milled, further supports the contention that until a healthier tone is imparted to mining as an investment by adopting methods more in keeping with sound business principals, the acquirements of stock in any mining company at its inception offers better prospects of success when taking reasonable precautions such as already suggested herein.

That such should be the case clearly shows that there is something "rotten in Denmark," and in our next issue we will attempt to demonstrate that mining, which at best can now only be considered in the light of a speculation, can be made more of an investment after the mine has reached the producing stage, by distributing the surplus over revenue expenditure (now erroneously called profit) in such a manner as to keep the shares at their true value.

(To be Continued.)

## MACHINERY NOTES

### Model New Plant of H. W. Johns Manville Co.

The completion of the new plant of the H. W. Johns-Manville Co., at Manville, N.J., marks another important chapter in the history of this concern.

Beginning with the consolidation of the H. W. Johns Manufacturing Co. and the Manville Covering Co., in 1901, the H. W. Johns-Manville Co. has grown by leaps and bounds until to-day it ranks as the largest concern in the world engaged in the manufacture of asbestos and magnesia products.

Branch houses are established in practically every city of prominence in the United States and Canada, and representatives in almost all foreign countries. Manufacturing plants are located in Brooklyn, N.Y.; Milwaukee, Wis.; West Milwaukee, Wis.; Hartford, Conn.; Nashua, N.H.; Lockport, N.Y.; Jersey City, N.J.; and an asphalt refinery at South Amboy, N.J. The company's asbestos mines at Danville, Province of Qubec, Canada, are the largest in existence, and produce the finest grade of asbestos.

The new Manville plant consists of nine buildings, which, together with their products, are classified as follows: A, textile and packing; B, rubber plant, electrical specialties and printing department; C, pipe coverings; D, paper mill; E, magnesia; F, roofing; G, mastic and waterproofing; H, roofing coatings; power plant and pump house.

These buildings represent the most advanced ideas in fireproof construction, being of brick, steel and concrete, with roofs of J-M Asbestos Roofing. They are planned not only for safety, but to afford the best operating conditions for the employes. The "daylight" form of construction which is employed throughout pemits a flood of light to enter the buildings through large triple-unit windows placed close together. Artificial illumination is provided in the form of J-M linolite lamps and Frink reflectors.

The hygienic conditions of this plant are ideal. Ventilation is furnished by means of steel ventilating sash which provide a constant supply of fresh air without causing drafts. Owing to the judicious arrangement of the macihnery, there is an entire absence of crowding and confusion which, in many factories, serve to hamper the operators in their work.

Each building has an average length of 1,000 feet, and is a separate factory in itself capable of being operated as an independent unit without relation to the other buildings in the group. The total combined floor area of all the buildings is about 1,000,000 square feet.

Power is furnished by the company's power plant which consists of the latest type of General Electric turbo generators, six Babcock & Wilcox high-pressure water-tube boilers aggregating 5,000 horse-power. All steam pipes are insulated with J-M Asbestos-Sponge Felted Covering in order to effect a maximum saving of fuel. The power and lighting cables, instead of being strung on overhead poles, as is generally the case in factory installations, are led underground through J-M Fibre Conduit, thereby eliminating cable trouble for all time.

The new plant is situated on a picturesque tract of 320 acres, divided by the Raritan River, in the town formerly known as Findern, N.J. The name has since been changed to "Manville." The company's private railroad system, comprising five miles of tracks, connects directly with the Central Railroad of New Jersey, the Lehigh Valley, and the Philadelphia & Reading Railroad, thereby insuring excellent shipping facilities.

About 3,000 men will be employed at this new plant, making a total of about 7,000 who are now employed by this company.

During the month of December the Elmore Vacuum plant at the Sulitelma mine, Norway, produced 650 tons of copper concentrates.

Danger signals for mines are being manufactured by the Stonehouse Enamelled Steel Mine Signal Co., of Denver. The signals are so designed as to attract immediate attention. The significance of the sign is perceived even by foreign labourers.

The Siemens Company, of Montreal, has received an order for a 5000 K.V.A., 3-phase, 60 cycle, 1800 r.p.m. tubo generator from the corporation of Edmonton. The generator is to be provided with the Siemens systems of axial ventilation so arranged that the hottest temperature in the machine can be measured. The Siemens Company has already supplied Edmonton with two generators and one induction motor.

**Pile Hammers.**—The McKernan-Terry Drill Co., New York, is putting on the market both heavy and light pile-hammers. To the former has recently been added a new accelerating device in form of an accelerating piston. Steam or air is conducted into the internal cylinder of the main piston through a small port in the accelerating piston, and is held against escape by a check valve. Entering on the downward stroke, it is highly compressed on the upward stroke. By this means not only is acceleration attained, but a positive cushion is provided.

# GOLD ON VANCOUVER ISLAND

In his recently-issued Memoir on South Vancouver Island, published by the Geological Survey of Canada, Mr. Charles H. Clapp, of that department, who began a geological examination in 1908 and continued it the following years, under the head of Economic Geology says that there are in southern Vancouver Island mineral deposits valuable, or possibly valuable, for gold, copper, iron, fluxes and pigment; also important structural materials including lime, and cement, clay, sand and gravel, and stone. Concerning gold, Mr. Clapp reports:

**Placer-Gold Deposits.**—Placer-gold deposits are the chief source of gold in southern Vancouver Island, and the only source which has here produced gold in paying quantity. Gold is reported from a large number of rivers and creeks on southern Vancouver Island, and "colours" can doubtless be obtained by panning in most of the streams. With two or three exceptions, the principal deposits all occur, however, in the streams which flow for a considerable part of their course over the Leech River formation. The gravels and sands near the mouth of Sombrio River have been known as a source of gold since the Spaniards explored the Pacific coast in the latter part of the eighteenth century. In the sixties the deposits in the Leech and Jordan rivers were discovered and worked the yield being estimated at between $100,000 and $200,000; and, somewhat later, coarse gold was found in the upper part of the San Juan River. For a number of years Chinamen have worked on Leech River, and one or two more extensive attempts have been made recently to obtain gold from Leech River and its north fork. At present, a partnership has been formed to work a large deposit of sand and gravel near the mouth of Sombrio River. Beside these deposits, which occur in the belt of the Leech River slates, small amounts of gold have been obtained from China Creek and Franklin River, emptying into Alberni Canal, and also from Nanaimo River.

Virtually all of the streams which occur in the belt underlain by the Leech River slates contain more or less coarse gold. With the exception of the two large valleys which occur along the northern and southern boundaries of the formation, the San Juan valley, and the valley which has been called Leech River valley (but which is occupied by several streams beside Leech River, notably Jordan River and its tributaries Bear Creek and Y Creek, and Lost River), the valleys are narrow and the grade steep. The amount of gravel in these streams is, therefore, small. It is very possible that relatively large amounts of auriferous gravel may be found on the wide, comparatively smooth, interstream areas. These interstream areas are, as a rule, drift-covered and heavily timbered, so that prospecting is carried on with considerable difficulty.

The amount of gravel, even in the Leech River valley, is not large throughout the greater part of its extent, but special conditions have existed in certain portions, which have caused its accumulation in large amounts. The conditions are not at present well understood. The largest known deposit occurs in the lower part of the valley, extending to the coast near the mouth of Sombrio River. Lost River, which occupies the western part of the Leech River valley, does not cross these gravels, but turns abruptly to the south more than a mile from the shore, and finds its way to the sea through a narrow canyon. The gravels are underlain by Tertiary conglomerate and sandstone, which are exposed at the shore and at the bend of Lost River at 320 ft. above sea-level. Near sea-level the Tertiary rocks are directly overlain by a sandy clay of indefinite thickness, but probably not more than 10 or 15 ft., which contains marine Pleistocene fossils. The overlying sand and gravel is from 300 to 500 ft. thick, and the deposit is one-quarter to one-half mile wide, and extends inland beyond the bend of Lost River, for a distance reputed to be more than two miles. On top of the gravels is a yellow garnet-bearing sand, 10 to 20 ft. thick, occurring at elevations of from 450 to 500 ft. above sea-level, although near the shore it occurs much lower, probably on account of local slips in the deposit. The sand consists largely of rounded quartz grains, and resembles a beach sand. Mr. R. S. Gallop, one of the partners who own the deposit, in a recent letter to Mr. Clapp, states that the mining engineers who have examined the deposit estimate the amount of gravel at 155,000,000 cubic yards, and th gold content at 12 cents a yard.

The orgin of the gravels is not at present clear. A large part of the gravel contains pebbles of many different rocks, and appears from its heterogeneous character to be composed of glacial detritus. It seems probable therefore, that the gravel was deposited by a large, post-Glacial river flowing westward in the Leech River valley before the recent uplift. This uplift diverted the river into its present course, that of the Lost River. The gold, if deposited under these conditions, was probably derived from a much larger quantity of glacial gravels.

A large amount of gravel occurs also in San Juan valley, but is probably low grade, as it is chiefly of glacial origin, and any gold that it contains does not appear to have been especially concentrated, except very locally.

The gold in the above-mentioned gravel deposits has doubtless been derived from the quartz veins which occur in the Leech River slates. These quartz veins, or more correctly small stringers and lenses, are very numerous, but they seldom attain any great size. The quarts of the veins is associated with a little albite, which in the sheared veins has altered to sericite. The only metallic minerals are a little pyrite or chalcopyrite, and free gold. The veins are, as far as known, very low grade, and are too small and barren to be profitably mined, and all attempts which have been made to work the veins have been unsuccessful.

The only development of the gold deposits of the Leech River belt going on at the present time is that of the large deposit of sand and gravel occurring along the west coast, near the mouth of Sombrio River. Messrs. R. S. Gallop, D. W. Hanbury, and W. H. Kirkbride have nearly finished the construction of a hydraulic plant to work these gravels. It is possible that other gravel deposits, sufficiently large to pay for the establishment of a plant, occur in other parts of the Leech River valley. As far as known these deposits are small, but the western portion of the valley has never been explored. Although the deposits of the San Juan valley are low-grade, thorough examination may reveal enough gravel to warrant the establishment of a plant designed to work large quantities of low-grade material. Thorough prospecting of the gravels on the upland between the two major valleys is also advised.

The upper parts of the Franklin River, China Creek, and Nanaimo River flow in a mountainous district formed of the Vancouver meta-volcanics, with intercalated lenses of limestone, both of which have been invaded by large granitic batholiths. Considerable mineralization has taken place near the contracts, and it is probable that the small amount of gold in the above-mentioned streams has been derived from mineral deposits of the character. As far as seen, the gravel deposits of these streams, which are likely to be gold-bearing, are very bouldery and restricted in amount.

Along the west coast of Vancouver Island, except where fringed by the Tertiary deposits, black sands which contain gold occur in the beaches. The gold, however, is quite flaky and would probably be saved only with considerable difficulty, as has proved to be the case farther north along this coast. The actual amount of black sand in the beaches of southern Vancouver Island does not appear to be large. Mr. Gallop, who has prospected the gravels and sands in the vicinity of Sombrio River, reports the occurrence of native mercury in the sands. The mercury was probably derived from such deposits as are known to occur on Cinnabar Creek, near Sechart, on the northwest side of Barkley Sound.

### Vein and Impregnated Deposits.

Continuing, Mr. Clapp states that in the southeastern part of Vancouver Island many of the quartz-feldspar veins, which were probably formed during the intrusion of the upper Jurassic granitic rocks, have been prospected for gold entirely without success. The true nature of these veins, or apophyses, has apparently not been recognized; for since the feldspar has altered to sericite, it resembles on the weathered surface white milky quartz, and the veins have, therefore, the appearance of ordinary quartz veins. The veins also contain pyrite, which altering to limonite has stained the exposed surfaces, still further hiding the true character of the veins. On microscopic examination, feldspar is always seen to be present, and usually in excess. Such veins as these have not been shown elsewhere to be gold-bearing, and it is not likely, therefore, that they contain gold in commercial quantities in southern Vancouver Island, and their prospecting should be discouraged.

Mineralized shear zones occur throughout the limestone and meta-volcanics of the Vancouver group, but are best developed near the contracts with the intrusive granitic rocks. Similar mineralized shear zones also occur in the granitic rocks themselves, especially near the contacts. Deposits of this character are usually more important as possible sources of copper, but they also contain small amounts of gold. A typical example is the deposit on the Alfreda claim, situated on the east slope of Gordon River valley, three miles above the mouth. Here the diorite has been tremendously sheared, forming a shear zone about 25 ft. in width, which strikes N. 50 deg. W. The sheared diorite has the appearance of a chloritic or amphibole schist, but its true nature is readily recognized on microscopic examination. Although traces of the original minerals and texture are maintained, the sheared rock is composed chiefly of secondary minerals, which include sericite, uralite, biotite, muscovite, chlorite, and a little epidote. In the shear zone quartz lenses have been developed partly by replacement. The quartz of the lenses occurs in irregular, usually very small, grains, up to 2 or 3mm. in diameter. Associated with the quartz is a very little plagioclase feldspar and sericite. The quartz contains disseminated grains of pyrite and magnetite, which have altered somewhat to limonite, and is cut by later veinlets of quartz and calcite. The quartz rock is said by the owner of the claim, Mr. T. M. Baird, to assay $2 a ton in gold and 5 oz. of silver. Unless considerably larger bodies of higher-grade are found, these deposits are of little or no commercial importance.

# SPECIAL CORRESPONDENCE

## ONTARIO.

### COBALT, ELK LAKE AND GOWGANDA

The discovery of some high-grade ore on the old King Edward mine at Cross Lake now being operated by the York Ontario under a five year lease, is of some interest. Too much importance can easily be attached to the discovery in as much as the King Edward has always yielded pockets of high grade ore and very rich wall rock, but general values were too small to make much profit. The new vein reported is at the adit level running parallel to the No. 5 vein which was always the strongest in the mine. The mine in former days was always staffed and mined on the scale of a big property, now that it is being operated on the basis of a prospect with a small force of men and at a minor expense it may be made to yield a profit.

It is understood that the Beaver Consolidated which secured the property of the Erie Cobalt as a water reserve, may try to find some silver there. The Erie was once famous on the Cobalt stock market, but as far as can be ascertained never produced an ounce of silver. The condition of the Cobalt market is now such however that it appears worth while to revive even such faint hopes as the Erie.

Application has been made to the Mining Commissioner for permission to pump out Kerr Lake in order that the silver that undoubtedly lays under its waters may be mined. According to the plans filed it is proposed to place a raft on Kerr Lake and pump the water into Giroux Lake, but these are probably only provisionary, and other means of emptying the lake may be adopted. Which ever way is taken there appears little doubt that the famous lake will be made accessible to mining operations this year.

Kerr Lake has an extent of forty acres, and is possessed by the Crown Reserve, 32 acres; the Drummond, 6 acres, and the Kerr Lake 11 acres. At least one-third of the great Carson vein on the Crown Reserve between the bottom of the lake and the first level is intact and contains millions of ounces that will be liberated when the lake is drained. In addition all the other vein systems since found on the Crown Reserve in all probability come to the surface and can be mined. It is an extraordinary fact also that sixty per cent. of the total area of the Crown Reserve has not been prospected yet. Some of this sixty per cent. is in the fecund conglomerate though not much of it, and therefore in that respect its undeveloped territory is not as great as it would seem. As to the Kerr Lake the last annual report states that of 6,660,091 ounces total ore reserves, 2,781,400 ounces are under the lake. Thus the Kerr Lake have in a known ore body over a million dollars to mine under Kerr Lake. The Kerr Lake early in its history blasted into the bottom of Kerr Lake and had to close up the hole with a concrete dam and abandon the working. They were mining bonanza ore when this occurred too.

Large shipments of bullion continue to be made to England. In the middle of the month one hundred and twenty bars of silver worth $78,000 left on one day for Liverpool. The Buffalo and Nipissing were the principal contributors, the Cobalt Townsite and the Casey Cobalt despatching but 5,000 ounces between them. The high grade plant at the Buffalo is now running smoothly and henceforth all silver will go out in bars.

Mr. Thomas W. Gibson, Deputy Minister of Mines for Ontario, in a preliminary review of mining for the past year estimates the production of Porcupine at $2,000,000, four times the total output of Ontario for any previous year. It is probable that Mr. Gibson made his estimates before the scope of the strike at Porcupine was realized, and the output will be somewhat less than that. Also he based his estimates on Cobalt at 30,000,000 ounces before the returns for December from some of the mines had begun to be known and it is likely that it will be nearer 31,000,000 ounces than 30,000,000 ounces.

Minority stockholders of the Wettlaufer silver mine in Buffalo are not satisfied with the manner in which the present management is dealing with the situation and they are soliciting proxies for the annual meeting which occurs on Jan. 27. Since the resignation of Mr. H. Lindsley as manager, Mr. Robert Livermore, manager of the Kerr Lake, has assumed the direction of affairs.

The annual statement of the Temiskaming Mining Company just issued to shareholders goes to show that profit on the year's working was $413,615 against $271,423 in 1911. The same amount was paid in dividends, namely $300,000, but the extra profits were utilized in liquidating the debt on the purchase of the North Dome on Porcupine. The cash surplus shown at the end of the year was $590,591. The returns from ore shales and shipments amounted to $762,653, while there is $13,980 due from smelters and $48,010 of ore on hand.

The old Alexandra mine on the top of Diabase Mountain is being pumped out, and operations will commence from the 300-foot level soon. The success of the Bailey has been the prime factor in inducing this company to resume operations and they hope to pick up the Baileys leads. A small plant has been installed for immediate work.

The Northern Customs concentrator have thrown out their four Nissen stamps and replaced them with ten stamps of the ordinary type. This brings the total number of stamps dropping in the customs mill up to 120, and about 400 tons of ore are being treated daily. According to its contracts the mill has from four to five years' work ahead of it. The mill is at present treating ore from the La Rose, the Cobalt Townsite, and the Drummond. The La Rose has just renewed its contract with the Customs Company on the basis of a hundred tons of ore per day for the next four years.

**Porcupine, Swastika.**

It seems most probable that the shareholders of the Crown Chartered Mining Company will lose the Davidson property, their only claim of real value. Mr. C. F. Dike, who came from Cripple Creek, Colo., to look after Crown Chartered operations in Porcupine has severed his connection with the company, and has been retained by the General Assets Company of Montreal, to act in their interests. The General Assets control the Dome Lake mine in Porcupine and the Cochrane in Cobalt.

Excellent progress is being made with the erection of camp buildings on the Tough claims at Kirkland Lake, and Mr. C. A. Foster who holds a controlling interest in the properties will soon be in a position to make a real start at mining. So far mining operations have consisted in open cutting for 36 feet by 10 feet deep and taking out a carload of high grade ore.

There are now far more prospectors working in the townships surrounding Kirkland Lake than in any other portion of the Northern Ontario mining field. The discovery on the Tough claims and some others has made a very lively interest in this section. The township of Morissette Lebel and Teek are being staked in very largely. An hotel is being built at Kirkland Lake for the accommodation of travelers between that point and Swastika.

## COMPANY NOTES

### CROWN RESERVE REPORT.

The Crown Reserve has a surplus now of $821,000, compared with $764,000 at the end of last year. This is a very encouraging increase.

The cash on hand now amounts to $352,000, while there is also $251,000 due from the smelters, which is virtually cash. The total assets stand over $3,000,000.

The following statement presented to the shareholders is as follows:

| | | |
|---|---|---|
| Credit. | | |
| By ore production | | $1,692,060.76 |
| Debtor. | | |
| Mining expenses, development, depreciation, etc. | $343,387.88 | |
| Smelters' charges and deductions | 53,869.18 | |
| Bonus to employees | 10,882.96 | |
| Royalty, Ontario Government, accrued and accruing | 147,910.03 | |
| | | 556,050.05 |
| Profit | | $1,136,010.71 |

**Profit and Loss Account.**

| | |
|---|---|
| Cr. | |
| By balance from 1911 | $ 764,851.76 |
| By profit operating for 1912, as above | 1,136,010.71 |
| By interest from bank | 9,083.74 |
| | $1,909,946.21 |

| Dr. | | |
|---|---|---|
| To prospecting, explorations and operations, Silver Leaf Issue, etc. | $ 27,264.91 | |
| To dividends, 1912: | | |
| Nos. 24 to 35, inclusive | 1,061,288.40 | |
| | | 1,088,553.31 |
| Surplus | 821,392.90 | |
| Mining lands, minerals and mining rights, building plant and equipment, etc. | $2,076,102.72 | |
| Stores and supplies | 11,667,13 | |
| Ore on hand | 50,000.00 | |
| Due from smelters | 251,528.11 | |
| Cash on hand and in bank | 352,896.62 | |
| McEnaney purchase price payments, and development, etc. | 269,080.97 | |
| | | $3,011,275.55 |
| **Liabilities.** | | |
| *Capital stock | $1,999,957.00 | |
| Royalty accrued and accruing, Ontario Government | 72,018.96 | |
| Accounts payable | 29,465.99 | |
| Dividend due Jan. 15, 1913 | 88,440.70 | |
| Surplus | | $ 821,392.90 |
| **Assets** | | |
| | | $3,011,275.55 |

## GRANBY MEETING.

A special meeting of stockholders of Granby Cons. Mining and Smelting Co., Limited, has been ealled for February 25th, to authorize an issue of not more than $5,000,000 bonds convertible into ordinary shares at not less than par.

Of the proposed new issue, Granby plans to promptly offer $1,500,000 to shareholders, pro rata, at par and interest.

In order to provide for the eonversion of these bonds, capital stock will be increased from 15,0000,000 to 20,-000,000.

The Directors have also ordered the resumption of dividend payments by declaration of 1½ per eent., payable March 1st to stoek of reeord February 4th. For purposes of dividend and speeial stockholders' meeting transfer books, close February 4th, and re-open February 25th.

The proposed immediate issue of $1,500,000 has been underwritten by bankers for a reasonable commission.

The last dividend on the stoek was 1 per cent. and was paid on December 30th, 1910.

## HOLLINGER'S HALF-YEAR.

The six months' statement of Hollinger Gold Mines with the fourth dividend shows that for the half-year up to the end of 1912 it produced gold to the value of $970,340, and made a profit of about $750,000 from the 43,227 tons crushed, the detailed figures being:

| | |
|---|---|
| Gold bars | $859,475 |
| Precipitates on hand | 24,498 |
| Slags on hand | 13,500 |
| Gold in solutions | 24,500 |
| Bullion in hand | 12,000 |
| Value of gold recovered | $933,973 |
| Lost in tailings | 36,367 |
| Total value in ore | $970,340 |
| Ore milled— | |
| From development, tons | 23,404 |
| From stopes, tons | 19,822 |
| Total | 43,227 |
| Average value of ore, per ton | $22.45 |
| Percentage of value recovered | 96.3 |

The estimated profit for the period being $750,000, although final figures may alter this to some slight extent.

The labour troubles brought down the net profits considerably.

## LA ROSE FOR 1912.

With the end of 1912 closed a successful year for La Rose mine, the December figures of which are as follows: Shipments during December, $106,604; income for month, $163,128; operating expenses, $67,826; net profit for December, $95,301.

The total income for the year 1912 was $1,796,880, and the operating expenses $779,916, leaving a net profit for the twelve months of $1,026,663.

The actual cash surplus to December 31, 1912, was $1,667,104, which, with $199,526 in outstanding shipments and ore on hand, brings up the total surplus to $1,866,631.

## KERR LAKE.

Application has been made to the Ontario Mining Commissioners by the Crown Reserve Mining Company and the Kerr Lake Mining Company for permission to pump out Kerr Lake. Drummond mine is also interested.

The proposal is to pump the water out into the Giroux Lake, or if that is not practicable Gelin Lake, whenee it will flow into the Montreal River.

It is estimated that 2,781,400 ounces would be made available by the draining of the lake.

## JUPITER MILL.

The installation of the mill at the Jupiter property will, it is reported, be started about the first of April. It is decided that eyanide treatment will be adopted for the ore, but other details of the mill remain as yet indefinite. These details will be worked out and the plans perfected within a short time.

## TEMISKAMING PROFITS.

The net profits of the Temiskaming Mining Company for 1912 were $413,615, as compared with $271,423 in 1911. Total receipts were $776,075, of which $762,653 was from ore sales and shipments. The profit and loss aeeount showed a balance of $477,441 from 1911 and $413,615 net profits in 1912. Dividends paid in 1912 amounted to $300,000, and a balance of $590,591 is carried forward for the year.

## SENECA SUPERIOR DIVIDEND.

The directors of the Seneca-Superior Company have declared a 10 per eent. dividend, payable on February 15th, to shareholders of reeord February 10th. The career of the eompany, whieh was only organized in January, 1912, has been remarkable in the extreme. The eompany has now been shipping ore regularly for some time and the stock has made rapid advanees on the market and yesterday stood at as high as 1.85 bid at the close.

*231,143 fully paid-up shares of $100 each, of the above amount are held as the Trustees for the benefit of the company.

**Chambers-Ferland Circular.**—A circular has been sent out from the office of the Chambers-Ferland Mining Company, notifying the shareholders that an agreement has been obtained from the Ontario Government whereby the royalty heretofore payable to the Giverument has been cancelled and released, subject to a provision that in case any large or valuable body or bodies of ore be found whereby the company makes in any calendar year, beginning with the first day of January, 1912, such a net profit from its mining operations as will enable the company to pay to its shareholders out of the net profits for such year a dividend in excess of ten per cent., then in such event after making allowance for payment of such dividend, the Minister of Lands, Forests and Mines may require the company to pay a royalty not exceeding the 25 per cent. royalty payable under the agreements therefore in force.

# STATISTICS AND RETURNS

### COBALT ORE SHIPMENTS.

For the week, 11 mines were on the shipping list, sending out 14 cars of ore, of which 11 cars contained high grade ore. A shipment of high grade was made from the Bailey mine, while the Casey-Cobalt also appears sending out 30 tons of high-grade from New Liskeard. The Drummond has shipped a car of concentrates to Thorold this week. A car of low grade came from the Seneca Superior. La Rose, with two cars of high grade, including one car containing 55 tons, headed the list for the week.

Four mines contributed in bullion during the week, the entire list being shipped on Tuesday of this week, Nipissing, Buffalo, Townsite and Casey-Cobalt were the shippers.

The shipments in pounds for the week follows:

| | |
|---|---|
| La Rose, 2 high | 174,855 |
| Dominion Red. Co., 2 low | 119,785 |
| Cobalt Townsite, 2 high | 147,863 |
| Cobalt Lake, 1 high | 64,535 |
| Trethewey, 1 high | 58,600 |
| Bailey, 1 high | 40,000 |
| Peterson Lake (Seneca Superior), 1 low | 84,299 |
| Temiskaming, 1 high | 62,087 |
| Casey-Cobalt, 1 high | 60,000 |
| Drummond, 1 high | 40,000 |
| McKinley-Darragh, 1 high | 83,600 |
| | 937,974 |

The bullion shipments were:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 63,641.36 | $39,777.26 |
| Buffalo | 54,712.00 | 35,000.00 |
| Townsite | 2,770.00 | 1,750.00 |
| Casey-Cobalt | 2,394.00 | 1,520.00 |
| | 123,617.36 | $78,056.26 |

For the year to date the bullion shipments from the camp are:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 114,760.66 | $72,301.91 |
| Buffalo | 54,712.00 | 35,000.00 |
| Trethewey | 5,077.00 | 3,223.00 |
| Cobalt Townsite | 2,770.00 | 1,759.00 |
| Casey-Cobalt | 2,394.00 | 1,520.00 |
| Miscellaneous | 2,637.00 | 1,575.00 |
| | 182,450.66 | $115,378.91 |

### B. C. ORE SHIPMENTS.
### Week ending Jan. 11, 1913.

Production of ore in the Kootenay and Boundary district for the week ending January 11 was 51,246 tons and smelter receipts were 42,222 tons. For the two weeks ending in the new year the production totals 101,789 tons and the smelter receipts are 87,835 tons. Output in detail was:

| | | |
|---|---|---|
| **Slocan and Ainsworth.** | | |
| Standard, milled | 400 | 800 |
| Van Roi, milled | 1,100 | 2,200 |
| Bluebell, milled | 1,200 | 2,400 |
| Kilo, milled | 100 | 200 |
| Rambler-Cariboo, milled | 300 | 600 |
| Richmond-Eureka | 27 | 27 |
| Colonial | 21 | 47 |
| Standard | 390 | 390 |
| Bluebell | 153 | 387 |
| Ruth | 38 | 79 |
| Eastmount | 27 | 27 |
| Black Prince | 6 | 6 |
| Other mines | ... | 309 |
| Total | 3,762 | 7,472 |
| **Nelson.** | | |
| Molley Gibson, milled | 300 | 600 |
| Granite-Poorman, milled | 250 | 500 |
| Second Relief, milled | 150 | 300 |
| Queen, milled | 400 | 800 |
| Mother Lode, milled | 500 | 1,000 |
| Yankee Girl | 100 | 252 |
| Hudson Bay | 109 | 291 |
| Emerald | 42 | 78 |
| Queen Victoria | 234 | 478 |
| Total | 2,095 | 4,299 |
| **East Kootenay.** | | |
| Sullivan | 1,408 | 2,116 |
| St. Eugene | 59 | 59 |
| Total | 1,467 | 2,175 |
| **Boundary.** | | |
| Nickel Plate, milled | 1,500 | 3,000 |
| Jewel, milled | 200 | 400 |
| Granby | 23,116 | 47,237 |
| Mother Lode | 6,900 | 13,875 |
| Rawhide | 5,224 | 10,610 |
| Napoleon | 757 | 1,459 |
| Unnamed | 110 | 201 |
| Knob Hill | 47 | 199 |
| Ben Hur | 112 | 149 |
| Snowstorm | 56 | 169 |
| United Copper | 34 | 95 |
| Total | 39,056 | 77,390 |
| **Lardeau.** | | |
| Ajax | 36 | 36 |

### Rossland.

| | | |
|---|---|---|
| Le Roi No. 2, milled | 300 | 600 |
| Inland Empire, milled | 90 | 180 |
| Centre Star | 2,710 | 6,296 |
| Le Roi | 1,162 | 2,414 |
| Phoenix | 14 | 14 |
| Le Roi No. 2 | 554 | 881 |
| Other mines | ... | 32 |
| Total | 8,830 | 10,417 |

### Consolidated Co.'s Receipts.

Trail, B.C.

| | | |
|---|---|---|
| Richmond-Eureka | 27 | 27 |
| Colonial | 21 | 47 |
| Standard | 390 | 390 |
| Bluebell | 153 | 387 |
| Ruth | 38 | 79 |
| Eastmount | 27 | 27 |
| Black Prince | 6 | 6 |
| Yankee Girl | 110 | 252 |
| Hudson Bay | 109 | 291 |
| Emerald | 42 | 78 |
| Sullivan | 1,408 | 2,116 |
| St. Eugene | 59 | 59 |
| Knob Hill | 47 | 199 |
| Ben Hur | 112 | 149 |
| Snowstorm | 56 | 169 |
| United Copper | 34 | 95 |
| Ajax | 36 | 36 |
| Centre Star | 2.710 | 6,296 |
| Le Roi | 1.162 | 2,414 |
| Phoenix | 14 | 14 |
| Le Roi No. 2 | 554 | 881 |
| Other mines | ... | 341 |
| Total | 6.115 | 14,453 |

### Granby Smelter Receipts.

Grand Forks, B.C.

| | | |
|---|---|---|
| Granby | 23,116 | 47,237 |

### B. C. Copper Co.'s Receipts.

Greenwood, B.C.

| | | |
|---|---|---|
| Mother Lode | 6.900 | 13.875 |
| Rawhide | 5,224 | 10,610 |
| Napoleon | 757 | 1.459 |
| Unnamed | 110 | 201 |
| Total | 12,991 | 26.145 |

### Cobalt Bullion for 1912.

The year's bullion shipments to date are as follows:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 3,929,954.28 | $2,391,357.31 |
| Crown Reserve | 451,770.87 | 256,905.50 |
| Temiskaming | 38,782.00 | 23,165.10 |
| O'Brien | 222,538.94 | 134,045.61 |
| Nova Scotia | 49,010.00 | 31,800.00 |
| Buffalo | 186,489.50 | 115,014.54 |
| McKinley-Darragh | 80,327 | 6,069.37 |
| Kerr Lake | 27,706.46 | 17,057.95 |
| Trethewey | 20,637.08 | 12,416.16 |
| City of Cobalt | 5,659.94 | 3,133.20 |
| Colonial | 1,698.00 | 1,018.00 |
| La Rose | 69,849.00 | 41,030.38 |
| Wettlaufer | 3,280.62 | 2,003.14 |
| Cobalt Lake | 5,256.88 | 2,989.75 |
| Right of Way | 505.50 | 273.00 |
| Cobalt Townsite | 8,582.55 | 5,362.00 |
| Drummond | 3,513.54 | 2,169.42 |
| Casey Cobalt | 940.00 | 574.00 |
| Dom. Red. Co. | 75,972.46 | 46,760.03 |
| Miscellaneous | 16,672.56 | 14,050.14 |
| Bailey | 14,050.50 | 8,816.65 |
| Penn-Canadian | 445.00 | 272.69 |
| Miller Lake | 946.00 | 788.00 |
| Totals | 5,311,476.49 | $3,117,984.45 |

### German Copper Consumption.

L. Vogelstein & Co. report the following figures of German consumption of foreign copper for the eleven months,—January-November—1912:

| | Tons. |
|---|---|
| Imports of copper | 191,993 |
| Exports of copper | 9,050 |
| Consumption | 182,943 |

During the same period of 1911, the quantity of 168,-096 tons was consumed. Of the quantity reported for 1912, a total of 166,307 tons was imported from the United States.

### YEARLY SILVER AVERAGES.

| | New York. cents. | London pence. |
|---|---|---|
| 1910 | 53.486 | 24.670 |
| 1911 | 53.304 | 24.592 |
| 1912 | 60.835 | 28.042 |

### YEARLY COPPER AVERAGES.

| | Electrolytic. | Lake. |
|---|---|---|
| 1911 | 12,376 | 12.634 |
| 1912 | 16.341 | 16.560 |

### SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| January 9 | 63⅝ | 29 5/16 |
| " 10 | 63⅝ | 29 5/16 |
| " 11 | 63⅝ | 29 5/16 |
| " 13 | 63½ | 29¼ |
| " 14 | 63⅛ | 29 1/16 |
| " 15 | 63⅛ | 29 1/16 |
| " 16 | 63⅛ | 29 1/16 |
| " 17 | 63 | 29 |
| " 18 | 63 | 29 |
| " 20 | 63⅛ | 29 1/16 |
| " 21 | 63 | 29 |

### GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.

Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

**Coke.**

January 21.—Connellsville Coke (f.o.b. ovens).

Furance coke, prompt, $4.00 per ton.

Foundry coke, $4.25 to $4.50 per ton.

January 21—Tin, Straits, 50.20 cents.

Copper, Prime Lake, 16.25 cents.

Electrolytic copper, 16.00 cents.

Copper wire, 18.00 to 18.25 cents.

Lead, 4.35 cents.

Spelter, 7.25 cents.

Sheet zinc (f.o.b. smelter), 9.00 cents.

Antimony, Cookson's, 9.60 to 9.70 cents.

Aluminium, 26.25 to 26.50 cents.

Nickel, 45.00 cents.

Platinum, ordinary, $46.00 per ounce.

Platinum, hard, $51.00 per ounce.

Bismuth, $2.00 to $2.25 per lb.

Quicksilver, $40.00 per 75-lb. flask.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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**Ontario**

Astley, J. W.
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Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Hore, R. E.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Miles, A. D.
Scott, O. N.
Segsworth, Walter E.
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Sutcliffe, & Neelands
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Willmott, A. B.

**Quebec**

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**British Columbia**

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Fowler, S. S.

**FOREIGN—New York**

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Hore, R. E. Houghton, Mich.
Constant, C. L. & Co.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

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**Ontario**

Brown, A. H.
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Heys, Thos. & Son.
John, D.
Canadian Laboratories, Ltd.
McNeill, W. K., Manager

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Obalski & Dulieux
Dr. J. T. Donald

**British Columbia**

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Carey, E. E., Cal.

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**ASHWORTH, JAMES**
MEMB. S. W. I. E.
Consulting Mining Engineer,
General Manager Crows Nest Pass Coal Co.
1909—1911
1109 Hornby St. VANCOUVER, B. C

**ASTLEY, J. W.**
Consulting Mining Engineer,
24 King Street West,
TORONTO, CANADA.
Phone M, 5199, Code: Bedford McNeill

**CARTER & SMITH**
Consulting Mining Engineers
448-449 Confederation Life B'ldg
TORONTO
W. E. H. Carter, B.A.Sc. Alex. H. Smith, M.I.M.M.

**COHEN, SAMUEL W., E. M.**
Consulting Engineer,
Room 601, Dom. Express Bldg. Montreal
General Manager,
Crown Reserve Mining Co. Ltd.
Cobalt, Can.

**DEPENCIER, H. P.**
Consulting Mining Engineer
Room 613, Dominion Express Bldg.,
MONTREAL.
Phone Main 4984 P. O. Box 763

**DEMOREST, STULL & LOW,**
Civil and Mining Engineers,
Ontario Land Surveyors Etc.
Sudbury, Ont.
Branch Office: Sturgeon Falls, Ont.

**EVANS, J. W.**
Mining Engineer,
Mines and Mining Properties examined and reported upon.
Belleville, Ontario.

**FORBES, D. L H.**
Mining & Metallurgical Engineer
306 Manning Chambers, Toronto, Ont.
Mine Examination and Consultation.
Metallurgical Engineer for Merrill Metallurgical Co.

**FOWLER, S. S.**
Mining Engineer,
NELSON, B. C.

**FERRIER, W. F.**
Mining Engineer and Geologist
204 Lumsden Bldg., Toronto, Ont.
General Manager, Natural Resources Exploration Co., Limited.

**FORBES, H. L. M.Sc.,**
Mining Engineer
77 Sparks Street., OTTAWA, CAN
Specialty: Mica Phosphate.

**GWILLIM, J. C.**
Consulting Mining Engineer,
KINGSTON, ONT.

**GRAHAM, STANLEY N., B.Sc.**
Mining Engineer
ROOM 23 MANNING ARCADE
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24 KING STREET W., TORONTO

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Special study and advice upon Ontario and Quebec mineral deposits, Including Cobalt and Porcupine.
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# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.



## ASSAYERS, CHEMISTS AND ORE TESTERS.



### Senca-Superior Silver Mines, Limited
### ANNUAL MEETING

The Annual General Meeting of Shareholders of this Company will be at the Head Office of the Company, 103 Bay Street, Toronto, on SATURDAY, FEBRUARY 15th, 1913 at 11 o'clock in the forenoon for the reception of the Financial Statement and Report of the Directors for the past year and for the election of Directors and for the transaction of such other business as may be brought before it.

AND TAKE NOTICE that a dividend of ten cents a share has this day been declared on the outstanding shares of the Company, said dividend to be paid on the 15th day of February next to the shareholders of record at the close of business on the 10th day of February, 1913.

By order of the Board,
R. F. SEGSWORTH,
Secretary-Treasurer.

Toronto, January 18th, 1913.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.
1218. Summary Report of the Geological Survey for 1911.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

ONTARIO

1213. Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.
1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

BRITISH COLUMBIA

940. Report on Graham Island, B.C., by R. W. Ells. (Reprint.)
1121. Memoir No. 13. Southern Vancouver Island, by Charles H. Clapp.
1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON and NORTH WEST TERRITORIES

080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

### MAPS RECENTLY ISSUED:

CANADA

942. Mineral Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmorland Counties, N.B. Geology and topography. Scale 1 mile to 1 inch.

QUEBEC

1112. Map 12A. Vicinity of the Tranco ntinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.
1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

ONTARIO

964. Geological map of portions of the districts of Algoma and Thunder Bay, Ontario. Scale 8 miles to 1 inch. Second edition.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.
1167. Map 29A. Mother Lode and Sunset Mines, Deadwood, B.C., Topographical. Scale 400 feet to 1 inch.
1147. Map 19A. Lardeau, West Kootenay, B.C. Topographical scale 4 miles to 1 inch. Contour interval 500 feet.
1197. Map 47A. Law's Mining Camp near Tulameen, B.C. Geological. Scale 600 feet to 1 inch. Contour interval 50 feet.
1219. Map 54A. Nanaimo Coal Area, Vancouver Island, B.C. Scale 1½ miles to 1 inch. Contour interval 100 feet.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of 10 cents is made for maps on linen.

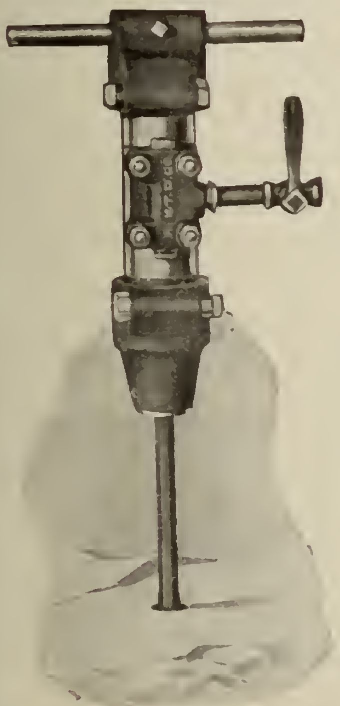
The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

# BUYERS AND SELLERS OF METALS

# McKIERNAN - TERRY
# Rock Drills

**It will pay you to investigate our line of McKiernan-Terry Wizard Rock Drills, with Cushioning Device and Corliss Valve, also**



96 lb. Shaft Sinking Hammer Drills.

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27 lb. Class "C" or 'Plugger' Hammer Drill.

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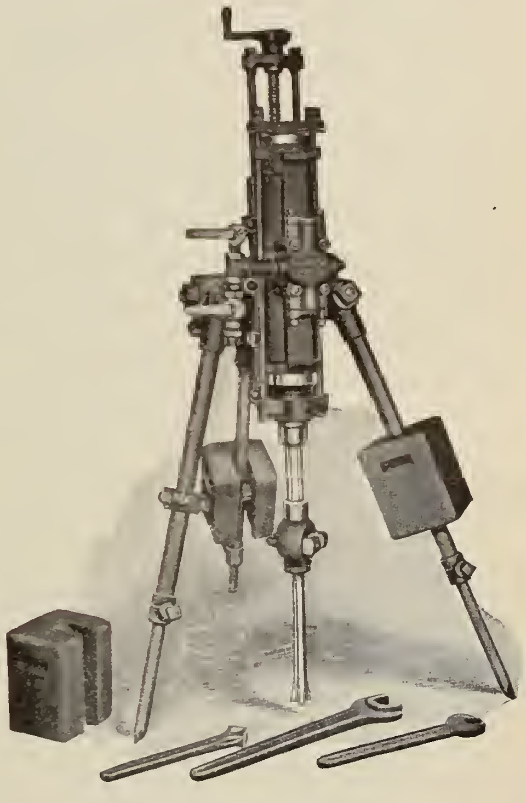

**CORE DRILLS—Any size Core, any depth Hole**

---

We manufacture a full line of mining, quarrying and crushing machinery and will furnish designs for any style of mining or milling plant upon request.

MINING MACHINERY DEPARTMENT:

## Canada Foundry Co., Limited

HEAD OFFICE:

**KING AND SIMCOE STS., TORONTO**

MONTREAL. HALIFAX. OTTAWA. COBALT. PORCUPINE. WINNIPEG.
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## ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamators—**
Allis-Chalmers-Bullock, Ltd..
Fraser & Chalmers, Ltd.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos. Hays & Son, 124 Yonge St., Toronto.
Canadian Laboratories, Ltd.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Allis-Chalmers-Bullock, Ltd.,
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.

**Beams—Steel—**
Dominion Bridge Co.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Belting—**
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.

**Blasting Batteries and Supplies—**
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Peacock Brothers.
John Davis & Sons.
Mussens, Limited.
Canadian Explosives, Ltd.

**Blowers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Boilers—**
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Robb Engineering Co., Ltd.
Canadian Ingersoll-Rand Co, Ltd.
John Inglis Co., Ltd.

**Buckets—**
Peacock Bros.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

**Building—Steel Frame—**
Dominion Bridge Co.
Canada Foundry Co.

**Cable—Aerial and Underground—**
Fraser & Chalmers, Ltd.

**Cableways—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

**Castings—**
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
C. O. Bartlett & Snow Co.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Crushers—**
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co, Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers,

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co, Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co. Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.

**Excavators.**
Jeffrey Mrg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

**Girders—Steel—**
Dominion Bridge Co.

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

**Injectors—**
Mussens, Limited.
Peacock Bros.

**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersol-Rand Co., Ltd.

**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.

**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.

**Lights—Mine Bldg—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Link Belt—**
Watrous Engine Works.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Nickel—**
Can. Copper Co.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.

**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.

**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

**Pneumatic Tools.**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Electric—**
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Pneumatic—**
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
E. Leonard & Sons.

**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersol-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

**Pumps—Turbine—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Vacuum—**
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Rolling Mill Machinery—**
Peacock Brothers.

**Rolls—Crushing—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.

**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Separators—Magnetic—**
American Grondal Co.
Wetherill Magnetic Separating Co.

**Shovels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

**Smelting Machinery—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
Consolidated Mining & Smelting Co.

**Stamp Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Canadian Ingersol-Rand Co., Ltd.
Peacock Bros.

**Steel—Manganese—Castings—**
Peacock Bros.
Hadfield's Steel Foundry Co.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
N. S. Steel & Coal Co.

**Steel—Structural—**
Dominion Bridge Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.
John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Transformers—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

**Tube Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Turbines—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Robb Engineering Co., Ltd.

**Water Wheels—**
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

**Wheels—**
Mussens, Limited.
Jeffrey Mfg. Co.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.

**Wire Cloth—**
Mussens, Limited.
B. Greening Wire Co.

**Wire (Bare and Insulated,**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
Roessler & Hasslacher.

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# THE CANADIAN MINING JOURNAL

OL. 34 TORONTO No. 5



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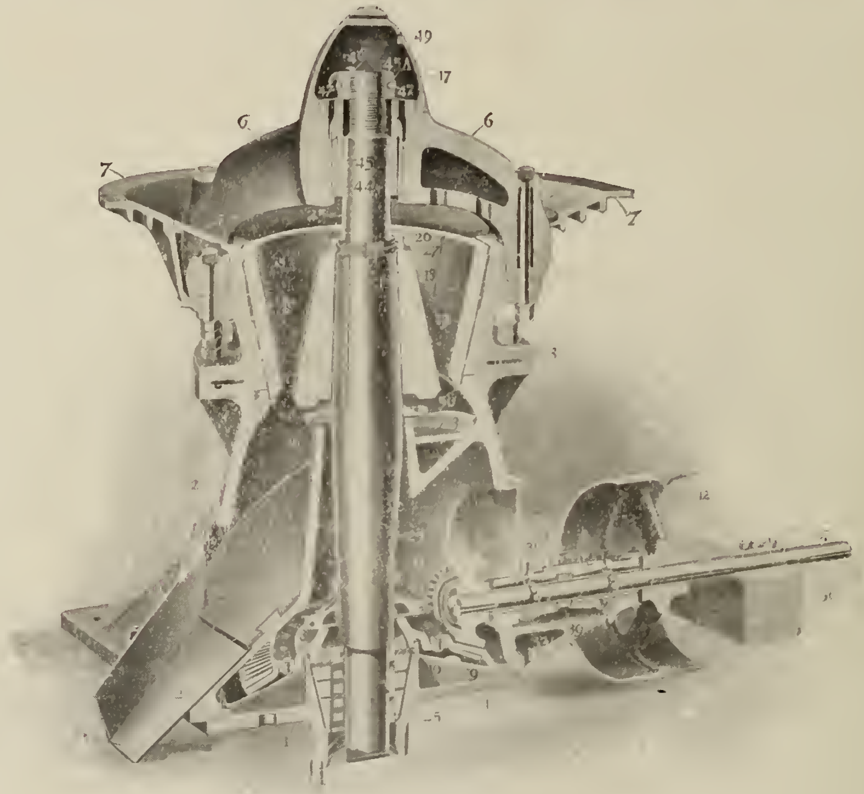
*THE OLD RELIABLE*

# GATES "K" BREAKER



SECTIONAL VIEW OF GATES "K" BREAKER

## WAY GATES "K" BREAKER IS BEST

REQUIRES LEAST POWER TO OPERATE:—This machine will break more rock per horse power than any other ever made.

EASE OF FEEDING:—The style of spider gives large and unobstructed feed openings which do away with clogging and consequent loss of time in working.

UNOBSTRUCTED DISCHARGE:—No limit of capacity at this point.

HIGHEST RANGE OF ADJUSTMENT:—Provides ease in changing the sizes of product and great facility for taking up wear of the breaking surfaces.

TOP SUSPENSION OF SHAFT:—Prevents the bottom bearings running hot under the hardest work and makes adjustments easy.

STRENGTH AND RIGIDITY:—Due to the liberal proportioning of the parts.

COOL RUNNING:—Because of extra large bearings.

EASE OF MAINTENANCE:—Every detail has been carefully worked out and every part particularly designed to do its work. Each part is easily accessible.

CONCAVES CAN BE CHANGED WITHOUT DISTURBING THE SPIDER OR HOPPER:—Impossible with any other style of breaker.

*SEE BULLETIN 1448*

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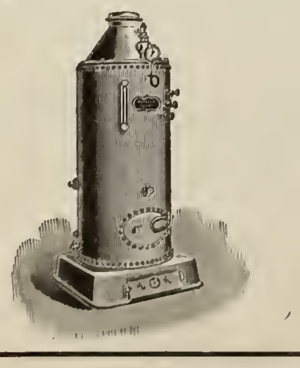

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# THE CANADIAN MINING JOURNAL

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CONTENTS.



## MINING AND POLITICS

The time has come for painfully plain speech about the attitude of the Dominion Government towards the mining industry. Despite the fact that the claims of that industry have been repeatedly put forward, and despite the further fact that the justice of those claims has been proved, the Government, through dilatoriness, indifference, or weakness, continues its policy of neglect.

Since the present Government was put in power, quasi —the Department (or, rather, the Department) of Mining has been blessed with no less than four changes of Ministers. Messrs. Nanton, Rogers, Roche, and Coderre have successively been appointed to this responsible position. Not one of these gentlemen has anything approaching adequate knowledge of the industry. It follows, therefore, that not one was appointed for the benefit of mining, and that only considerations of expediency influenced the situation.

There has been ample mincing of words and phrases heretofore. The Canadian Mining Institute, through its delegations and at its meetings, has voiced the desire of the mining man for better treatment. Whilst its delegates have walked softly and talked politely, they cannot have failed to impress upon the Rt. Hon. Mr. Borden and his Ministers the fact that the Institute as a whole deplores and resents the futility of the past and present situations. Briefly, therefore, the treatment accorded the mining industry appears to be calmly deliberate.

This being the case, there is only one course to pursue. The Canadian Mining Institute has a membership of over one thousand. Its representations to the Government have been without avail. It behoves the members, therefore, to use other means to obtain their rights. And the only means left is the exercise of whatever definite and legitimate political influence they may possess. In short, the members of the Institute and the mining community at large must realize that as a body they cannot afford to have their just claims repeatedly ignored. While there may be no necessity for using threats, it certainly is clearly necessary to demonstrate to the Government that mining men are a strong factor in determining political fortunes.

The forthcoming annual meeting of the Canadian Mining Institute should be made memorable by the formulation of a Bill of Rights. We have definite grievances. The Institute, which is the only national organization representing the industry, must assume the duty of presenting these grievances forcibly and completely. While, of course, the amenities will be regarded, our claims can no longer be put forward as nebulous suggestions; they must be clothed in positive and categorical language. The industry of mining must assert itself.

It is not compatible with the dignity of the industry that its departmental head in Ottawa should be chosen for merely political reasons. He should be first and always a mining man. If such a person be not available in Parliament there is nothing to deter the Government from making a selection outside. This has been done in several notable instances, and never has there been better reason for repeating the step.

If the Institute seizes this chance of facing facts firmly it will have conferred a lasting benefit upon the nation.

At present the second largest industry of Canada is without representation in the House of Commons or in the Senate, and its ministerial administration is a negligible quantity.

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## THE CANADIAN MINING INSTITUTE ANNUAL MEETING

Owing to the fact that certain officials of the Geological Survey have conspired together to enliven the approaching annual meeting of the Institute at Ottawa, it may be readily believed that the visitors will suffer no boredom. The smoker and the dinner, which, after all, are the main features of the meeting, will be enlivened by flashes of geological wit, and by infusions of departmental humour.

The gathering is to be formally opened by His Royal Highness the Duke of Connaught. Then will follow the regular routine of presenting Dominion and Provincial statistics, etc. Among the papers to be read during the afternoon session are several dealing with the mineral industries of the Ottawa district. These should be the most instructive. The evening session will be devoted to a lecture on Yukon Territory, by Dr. Henry M. Payne. Dr. Alfred M. Thompson, M.P., will occupy the chair and will also speak on the same subject. During the remaining session the papers read will be remarkably well chosen and varied. Speaking generally, they will be of much more practical interest than many of those presented on previous occasions. In fact, if we may judge by the titles, the Secretary is to be congratulated upon securing a fine list of subjects. Certain malign spirits will learn with joy that few geological essays are to be inflicted on unwilling ears. It is not known whether this is or is not a concession to stiff-necked Philistines.

. . . . .

We hope and believe that every attending member of the Institute will do what in him lies to contribute to the success of each and every session. Much earnest thought has been given to this meeting. It is very necessary that the attendance be as large as possible. It is equally necessary that the proceedings be as animated as they can be made.

Let us get together and see that a record attendance is assured, and that discussion never lags. We owe it to the officers of the Institute, to the Institute itself, and to our official hosts in Ottawa, to make a good showing.

## TWO NOTABLE PAPERS

Six times a year the American Academy of Political and Social Science publishers a substantial volume of essays covering a wide range of apposite subjects. The last volume is wholly devoted to things Canadian. Reciprocity is discussed by the Hon. Clifford Sifton—who probably knows what he is writing about better than most authorities. Canadian banking is tackled by Mr. H. M. P. Eckardt, who is, perhaps, a trifle fulsome in his appreciation of our lop-sided system. Mr. J. Castell Hopkins is equally appreciation of Canadian literati. He tabulates many of our ephemeral performers and is generously inclusive. An Englishman, Mr. W. A. Chapple, M.P., describes us as a hospitable and not unintelligent race, which, by the way, makes us feel deucedly cocky. Other writers discourse upon various other phases of our national life.

The two papers, however, that interest us most are from the pens of Dr. G. A. Young, of the Geological Survey, and Mr. J. M. Clark, K.C., of Toronto. Dr. Young writes on the hackneyed theme, "The Mineral Resources of Canada," and does so very creditably. Mr. Clark's paper is entitled, "Mining Legislation in Canada."

Writing for non-Canadian readers, Dr. Young naturally has to include in his essay much material that to our informed minds may appear trite and worn. In fact, we never have coveted the task of expatiating on this particular subject. But it is to Dr. Young's credit that he has been nimble enough to make his article clear, readable, and comprehensive. After tracing the phenomenal growth of Canada's mining industry and, by means of vivid comparisons, impressing its recent expansion strongly upon the reader, Dr. Young dwells upon the untouched regions of Canada. "In the imperfectly prospected and unprospected regions there is an almost unlimited area over which the geological conditions are similar to those of districts of known mineral wealth. The presence of like geological conditions implies the existence of like mineral deposits, for experience has demonstrated that the mineral deposits of any grown districts have resulted, directly or indirectly, from the action of the same general forces that gave rise to the broader geological structures and features of the region. Therefore, in order to indicate approximately only the probable extent and value of the mineral resources of a country, it is necessary to give at least a broadly generalized description of its geological features." This generalized description follows, and it is an excellent bird's-eye view of Canada's geological features. Each of the six great geological regions, or provinces, is described, and the characteristic deposits of each are mentioned. The essay concludes thus:—"Only in the comparatively limited area extending eastward from the St. Lawrence valley is the annual production in any way commensurate with the known mineral resources of the country. And even in this eastern region, the discoveries of late years have indicated the existence of previously unsuspected classes of mineral deposits. Over nearly the whole of the vast area of Canada the mineral "resources at present being developed are confined to "very limited areas bordering the main routes of travel. "Even within these circumscribed areas it is indisput- "ably known that great stores of mineral wealth still lie "untouched or undiscovered."

Mr. Clark's essay is entirely different in character from Dr. Young's. The writer's object is to trace the growth of our mining laws and to show the relations existing between Federal and Provincial legislation. He recognizes the unequal, sketchy, and clumsy nature of the present laws, and emphasizes the need of sounder and more comprehensive enactments. Referring to the proposed Federal mining law, Mr. Clark says:—"The "framing of this general law is regarded by mining men "as supremely important, not only on account of the great "interests actually and potentially involved, but also be- "cause it is looked upon as the first step towards the uni- "fication of the mining laws of Canada. The vital im- "portance of such completeness, wisdom, and practical "convenience being embodied in the Federal statute as "will recommend it to the several provinces for volun- "tary adoption is therefore self-evident."

An allusion to the "apex-law" is also interesting. It runs thus:—"There is no danger that the so-called 'apex "law' will be again introduced into Canada. That law "was copied under the influence of miners from the Pa- "cific States, by British Columbia, but was finally abol- "ished April 23, 1892. . . . . The vested rights of claim "owners who had located their claims under former acts "were protected; and the 'apex law' in British Colum- "bia, as elsewhere, has given rise to costly litigation, "which seems inherent in the system of extra-lateral "rights."

As to the problems of "blanketing," taxation, and royalties, Mr. Clark points out, that has the present opportunity of "taking full advantage of the results of min- "ing codes in other countries and of her own unique ex- "perience of various systems of law."

The three essentials are "generality, equality, and certainty." And the greatest of these, says Mr. Clark, is certainty.

## EDITORIAL NOTES

Whether the shortening of working hours in Cobalt was or was not a strategic move, it was commendable. Any reasonable concession to prevent a strike is worth while. It is deplorable, however, that the miners of Northern Ontario are so helplessly in the hands of parasitic labour-union demagogues. The men, if left to themselves, would steadily improve their condition without antagonizing their employers. As for the demagogues, an occasional strike is a necessity if for no other reason than that they may handle the strike funds. We firmly believe that a public investigation of the administration of labour-union funds is urgently required.

Conditions in respect of the Quebec asbestos industry improved greatly of late. There is now a considerable demand for fibre; and, notwithstanding the fact that the production in 1912 was the heaviest on record, stocks, we are informed, are practically depleted.

In an editorial note, in the last issue of the Mining Magazine, commenting on a recent meeting of the Institution of Mining and Metallurgy, the remark is made that really good papers do not provoke discussions; whereas "poor papers stir the combative and controversial powers of an audience to a degree highly beneficial in so far as they tend to balance the inadequate treatment of any subject by supplementing a paper with a discursive and illuminating discussion." Broadly speaking, this is true; but then from the technical society's standpoint the poor paper becomes the good paper, for the principal raison d'etre of a paper submitted for discussion should be to provoke discussion. Fortunately, however, we may have a "good" paper, that is to say an informative and intelligently written paper, provocative of controversy. "The Domes of Nova Scotia," contributed last year by Mr. T. A. Rickard to the Canadian Mining Institute and to the Institution of Mining and Metallurgy, was without doubt an excellent paper, nevertheless it was not received in silence. No one has made a better case for the inorganic origin of petroleum than Mr. Coste, in the several papers he has contributed to the Canadian Mining Institute, yet who will forget the expostulatory storm for which the elucidation of his theories was responsible. We are not altogether inclined to agree, therefore, with the opinion that "really good papers do not provoke discussion."

Neither diamonds nor placer gold has been found on the shores of Hudson's Bay by the several parties that have voyaged to look for it. Morever, the Quebec Government has just issued a report which declares that it will be quite useless to look for the precious stones in the blue clay of the great clay belt, inasmuch as it has an entirely different origin from that wherein the diamonds are found in South Africa.

Partly through the generosity of Dr. James Douglas the Kingston School of Mining has been enabled to extend its tutorial system. At present some twenty tutors are employed.

According to the estimates of L. Vogelstein & Co., the consumption of lead in the United States increased 15 per cent. during 1912. The total consumption approached 460,000 tons. The production from domestic sources was about 400,000 tons, the difference being drawn from stocks on hand. This reduces the working balance to a smaller amount than has been recorded since 1907.

Mr. Malcolm McNaughton, of the Dixon Crucible Co., in an article appearing in the Engineering and Mining Journal, after asserting that Ceylon remains the important source of crystalline plumbago, and that nowhere else in the world does the material occur where the conditions are such that it can be mined with profit, states that during the last twenty-five years some forty projects for the production of flake graphite have been initiated in the United States and Canada, of which only three are at the present time in full operation. The reason for the non-success of these undertakings is ascribed to verious causes, but chiefly to lack of resources or of knowledge of market conditions. Mr. McNaughton remarks, however, that the capacity of the mills on this continent is from eight to ten times greater than the present demand for flake graphite. The difference between the American and the Ceylon graphite is apparently that of structure. The former occurs as thin flakes disseminated throughout the rick, requiring an elaborate system of crushing and concentration for their separation. The resulting flakes are extremely thin, while the Cox prepared Ceylon plumbago is more granular in structure.

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The Engineering and Mining Journal states that the trade in cobalt oxide is closely controlled. Prices during 1912 remained stationary at 80 cents per pound, but an increase to 90 cents has been announced to apply to 1913 contracts. The main imports of the United States are derived from the subsidiary companies of the International Nickel Corporation. It is stated that there is some recovery of cobalt from the ores of the Cobalt district, but by no means to the extent possible if warranted by a wider general use of the metal. It is meanwhile reported that there are over 3,000,000 lbs. of cobalt-nickel residues at Canadian and American refineries at which Cobalt district ores are treated. In view of the possibilities, the result of the experiments now being conducted by Dr. H. T. Klamus, at Kingston, under the auspices of the Dominion Department of Mines, to determine the value of cobalt as an alloy for steel and other means of utilization, are awaited with much interest.

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## METAL LINER FOR TUBE MILLS

The Komata tube mill liner, which consists of a series of plates and lifting bars, first introduced in New Zealand at the Komata Reefs mine several years ago, is now being used in mills in America. The angle bars which form the ribs of the liners are of manganese steel, and liner plates of the same composition as usually recommended, though they can be made of either semi-steel, white, grey or hematite iron. The filler bars, which are placed underneath the angle bars and are not exposed to wear, are of soft cast iron. The several pieces of the liner are fastened to the shell of the mill by means of square-headed taper bolts. The ribs or angle bars are spaced about 18 or 20 inches apart, according to the diameter of the mill. It is claimed for this liner that (1) it gives a maximum area of mill, and, therefore, increased capacity; (2) absence of slipping of pebbles on the liner results in prolonged life of the liner, the prevention of flattening of the pebbles, and the avoidance of much waste power: (3) by reason of the cascading action of the pebbles their spherical shape is maintained, and this rolling action of the pebbles produces a greatly increased grinding action; (4) the consumption of pebbles or flints and the amount of power required per ton of sand are small; (5) the metal is distributed to give the greatest amount of life and the least amount of scrap when worn out; (6) it alters but slightly as regards thickness and shape, which means constant peripheral speed on the inside of the liners and uniform efficiency; (7) it is easily and quickly installed and repaired; (8) it can be cast at local foundries of semi-steel, white, grey or hematite iron.

## TUBE MILLS AT NEW PRIMROSE MINE

Two tube mills of standard size, 22½ by 6 feet, have recently been added to the New Primrose mine's equipment. The "South African Mining Journal" remarks that "the putting in of tube mills at this fine old property affords an interesting commentary on the manner in which the New Primrose is opening up. A few years ago the mine was believed to have but a limited life; in fact, estimates framed just after the conclusion of the war gave one to suppose that by the end of the current year the mine practically would be exhausted. Recently developments have been so eminently satisfactory that the management decided to augment and modernize the reduction plant, and there appears to be every prospect of the company contributing a substantial quota to the dividend list for a number of years to come.

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## INTERNATIONAL GEOLOGICAL CONGRESS

### Suggested Programme for the Twelfth Session.

In a recent circular the Organization Committee of the International Geological Congress has outlined a provisional programme for the Toronto meeting. The general meeting will be held in Convocation Hall, Toronto University, while for the sectional meetings numerous lecture rooms are available. The division into section will probably be as follows:

**Section 1.** Sub-section a—Pre-Cambrian Geology.
" b—Economic Geology.
" c—Peliology, Mineralogy, etc.

**Section 2.** Palemtology, Mineralogy, etc.

**Section 3.** Glacial Geology and Physiography.

On the evening of Wednesday, August 6th, at 8 o'clock, an informal reception and re-union will be held in Convocation Hall.

On Thursday morning, after a conference of the Council of Organization, the formal opening will take place, probably presided over by the Duke of Connaught. The retiring and incoming Presidents and Secretaries of the Congress, the President of the university of Toronto, and his Worship the Mayor of Toronto will give addresses.

At 3 o'clock on Thursday afternoon, discussion of the major topic of the coal resources of the world will be commenced.

In the evening a public address will be given in Convocation Hall.

For a full week thereafter on each day there will be held general and sectional meetings, and a long series of excursions. On the second last evening a banquet will be given in honour of the visitors.

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## SILVER COINAGE IN INDIA

Mr. Harold Baker (Financial Secretary, War Office), replying for Mr. Montagu, Under-Secretary for India, to a question by Mr. Bigland (U., Birkenhead), says: The amount of silver coined in 1911-12 at the Indian mints was as follows:

| | Standard ounces. | Equivalent in fine ozs. |
|---|---|---|
| Whole rupees, re-coined .. | 9,107.934 | 8,424.839 |
| Whole rupees, new ....... | nil | nil |
| One-half, one quarter, and one-eighth rupees, new ...... | nil | nil |
| One-half, one quarter, and one-eighth rupees, re-coined. | 405,829 | 375.391 |
| British dollars ........... | 31,596,753 | 29,226,997 |

The British dollars were coined at the requisition of banks. There is no "issue price," since the mint merely coin the silver tendered by banks and issue the dollars to the banks charging 2 per cent. for the work done.

# CORRESPONDENCE

## INTERMITTENT CYANIDATION

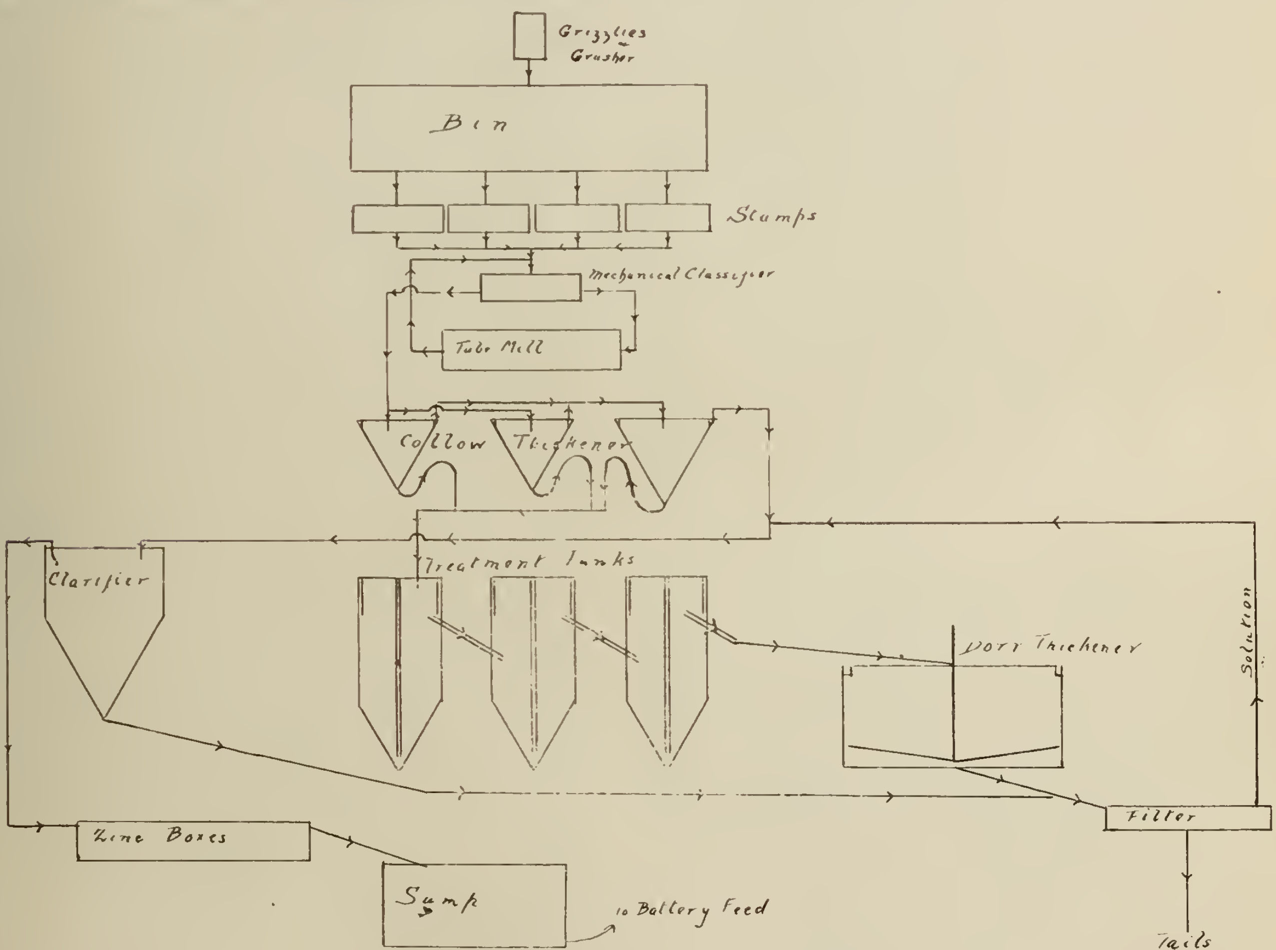
Editor The Canadian Mining Journal, Toronto:

Sir,—Mr. Leon P. Hill's article is of considerable interest to many metallurgists and raises questions upon which there is a great divergence of opinions.

It may be that theoretically the charge system surpasses the continuous, but I venture to say that in many cases theory and practice are at variance with one another, and as far as Mr. Hill's statement as to the popularity of the continuous system goes I should say that there is a direct verdict in favour of such a system and that it has been approved by many metallurgists. In his assumption of a series of 100-ton tanks, These show a tendency of the finer particles to go through the tanks, after some adjustment and on somewhat coarser material hardly and difference was shown as follows:

| | Influx to first tank. Pct. | Efflux from third tank. Pct. |
|---|---|---|
| On 100 mesh ........ | 12.4 | 12.0 |
| On 150 mesh ........ | 61.0 | 62.0 |
| On 200 mesh ........ | 12.4 | 11.6 |
| Through 200 mesh .... | 14.2 | 14.4 |

My idea of a continuous plant would have a flow sheet as follows:




Mr. Hills gives some figures which are no doubt correct, but he states that the heavier and coarser particles make the most rapid transit through the series. This I do not agree with, my experience has been the reverse, namely that the finer and lighter particles will pass most rapidly through a series of tanks, thus giving the heavier and coarser particles the longer treatment which is in some cases required; at the same time I should say that the most ideal system would be one which shows an even flow of all sizes of particles.

The following are a set of figures which were obtained from a set of three tanks on the continuous system using both air and centrifugal pump agitation:

| | Pct. | Pct. | Pct. | Pct. |
|---|---|---|---|---|
| On 100 mesh ....... | 7.9 | 6.6 | 3.6 | 2.8 |
| On 150 mesh ....... | 18.8 | 12.8 | 9.4 | 9.6 |
| On 200 mesh ....... | 16.2 | 22.4 | 26.2 | 25.8 |
| Through 200 mesh... | 57.0 | 58.2 | 60.8 | 61.8 |

The treatment tanks would be a modification of the Pachuca and Patterson having both air and centrifugal pump agitation, through a central column, and having a baffle which gives a circumferential quiet zone, this zone would have a double use, one for decanting and the other for pump suction, thus saving pump liners by not having any grit going through. The three callow thickeners would be used as follows: Two would take the direct overflow from the classifier, the thickened product going to treatment tanks. The overflow from these two goes to the third callow which would be somewhat larger than the others, the thickened product from this also going to treatment tanks and the overflow which would be fairly clear to the clarifier. This clarifier should be one of the canvas leaf system which not only takes the solution from callows, but also solution from Dorr thickener and filter, ensuring a perfectly clear and clean solution for the zinc boxes. Again, if any slime should get in the clarifier this would be let out occasionally to the Dorr thickener or filter. The filter used could be either pressure of vacuum. The choice rests with the person who supervises the putting up of the plant. Personally I like a Butters or Moore but have no data to offer on these filters.

The merits of such a system as this are, I think, far superior to those of the intermittent system, inasmuch as the time factor of settling and decanting on the intermittent as described by Mr. Hills would be enormous, and sufficient tank capacity must be provided to take the ore while the first or second tanks are undergoing this settlement, etc. Again, in his system of charging the tanks I should say that the finer and lighter particles would find their way more rapidly to his washer than would be expedient. I also notice that Mr. Hills has the washing solution and water returning to the general circuit, which means that the solution is everlastingly growing until finally some would have to be run to waste or an enormous storage capacity provided.

Yours faithfully,
GEO. G. THOMAS,
Metallurgist.

## AS IT OCCURRED

To the Editor The Canadian Mining Journal:

Sir,—Dr. Barlow, in his Presidential address, delivered at the Victoria meeting of the Canadian Mining Institute, as reported in the Quarterly Bulletin No. 20, said: "At our last annual meeting there was a rather regrettable occurrence when a mining engineer of repute questioned the value of much of the geological work carried on in Canada." This doubtless refers to the half-brick which his paper on Porcupine stirred me to throwing. Much of the work geologists have done and are doing for the mineral industry and for the mining engineer is splendid. To contend otherwise would be ridiculous. I threw my brick at the posing of certain geologists. My remarks were made entirely on the spur of the moment and are not as carefully worded perhaps as they might be, but they were sound and raised a note not without value. I attach a copy of the "regrettable occurrence" and would ask you to publish it. I am sorry that the publishing committee have not seen fit to publish Dr. Barlow's paper that provoked the remarks.

Yours faithfully,
H. E. T. HAULTAIN.

February 20th, 1913.

Mr. Haultain—I must confess to a growing peevishness, and peevishness is a bad thing to be afflicted with, at the attitude of our local geologists. There are a great many of our local geologists who since they have broken from the Survey——

Mr. Tyrrell—I object to that term, I do not see there is any peevishness whatsoever——

Mr. Haultain—As I was saying, those geologists who have broken loose recently from the Survey, have posed and loomed very largely in the public mind and public eye and in the public press. Their appearance of importance more particularly in regard to the Porcupine district is very very different from their real importportance. Now my experience of the field, fairly limited, has been that an ordinary mining engineer has assimilated sufficient useful geologic knowledge for most of his purposes, and I find that the man who was brought up primarily as a geologist, and goes into the field later, often remains hopelessly geological. This is my peevishness. Now, I will admit, I would be one of the first to admit, that the geologist is of very great importance to the mining interests, as you, sir, so ably showed to us yesterday, but he is not altogether everything up in the Porcupine district. I am particularly glad to see my peevishness accounted for to a certain extent in the result of these two papers by alleged eminent geologists—I say that, sir, alleged eminent geologists. We have been told of three results, as far as I can gather; that the veins go down—I am sure the promoters will seize on that with the greatest of glee. A further thing we were told, and I do not know that it will worry metallurgists very much, is, as we go down the gold will become more refractory—no doubt it will, it has a habit of doing that, and also another to the man up there now.

Now I wish to congratulate our publicity department, for having got off, I believe quite unconsciously, an excellent thing in this morning's "Globe" which strikes me as fitting the case. They refer to a geologist as "An eminent authority on an absolutely unknown region."

# MINING INVESTMENTS

Written by a Mining Accountant.

(Continued from February 1st Issue.)

In the February number of this Journal, when dealing with the matter of sizing up the merits and demerits of mining investments, the writer gave reasons why the acquirement of mining stocks after the payments of dividends thereon generally involves risks far greater than when buying shares in a company at its inception. That this is so and will always remain so in the majority of cases just as long as the present practise of distributing the whole of the surplus income over revenue expenditure in the form of dividends is continued, appear evident. For whereas on the one hand the shares are generally too high to make the ultimate return of capital and a fair rate of interest possible—except in cases when the mine becomes richer at depth—the investment on the other hand offers fair chances of success when due caution is exercised in the manner suggested and when, also, the mine is well investigated and not over capitalized.

The question of inflation or over capitalization, however, is quite another matter and there is no reason why mining companies should not conduct their affairs more in keeping with sound business principles or in such a manner that the shares are never in excess of their actual value.

Under prevailing conditions a company capitalized at $1,000,000 and having, say, an annual income exceeding the revenue expenditure by $400,000, would distribute this so-called profit in the form of dividends.

With this return of 40%, the shares would then in the usual course advance to nearly treble their par value, or until at market price they returned only 15%. This is where the investor is up against inflated values unless, as is very seldom the case, the positive ore reserves, or the conditions generally are such that a similar income is reasonably assured for the next twenty years, as would be necessary for the ultimate replacement of capital and the payment of a rate of interest high enough for mining investments.

On the Transvaal and several other established fields there is some justification for figuring so far ahead of developments. There the ore bodies have been proved to exist at great depth, and the values are so evenly distributed that it is safe to assume that by sinking a certain depth and driving a certain distance within the vertical limits of adjoining properties on the same vein, so much ore having a certain value would be blocked out. On new fields, however, such as Porcupine, the indications at present are certainly not sufficient to justify figuring on any ore for than 100 feet beyond the bottom level and then only when the ore body does not show a falling off in width and value. If tonnage merely is considered this method of determining the life ahead of any Porcupine property for instance, may be considered unduly conservative. But although geologists may agree that the veins must persist to a great depth, there are other points to be considered, such as the falling off in values, shortening of ore shoots, faults, blanks for hundreds of feet as in Bendigo, Australia, (one of the oldest fields in the world) to say nothing of increased working costs and the development of refractory instead of free milling ore as depth is attained. With such contingencies, the possibilities ahead of any Porcupine mine as regards the payment of dividends can only be classed with safety with the "positive" and "probable" ore reserves. In the case of a company such as already instanced, having on the "positive" and "probable" reserves only sufficient ore to maintain the profit of $400,000 per annum for three years, it will readily be seen that there is really no justification for the shares advancing to a price returning only 15% on the investment. Thus the shareholder coming in on such an inflated value is very lucky indeed if he does not clean up minus a large portion of his capital.

This unsatisfactory state of affairs brought about by the common practice of returning capital in the form of enlarged dividends would not exist if mining companies were compelled by law either to create an "Amortization Fund" for the replacement of capital or to notify the shareholder what proportion of the income over revenue expenditure should—guided by the estimated life ahead of the mine—be set aside for the replacement of capital, and how much of this so-called profit should be considered such.

For instance, in the case of a mine as already cited being capitalized at $1,000,000 and having an annual balance of $400,000 over all charges including depreciation and development redemption, and sufficient ore —"positive" and "probable"—to maintain this surplus for three years, we contend for reasons given above that one-quarter of the capitalization at least, that is $250,000, should be set aside for the replacement of capital thus leaving $150,000 for dividends on an annual payment of 15 per cent. On this distribution of the actual profit it will be seen that the shares when returning 10% would show an advance of 50% on the par value thereof. This, then, would be legitimate and those acquiring shares at this valuation would be duly protected against the loss of capital. To bring this about is really the duty of directors and consulting engineers who should, in the writer's opinion, be compelled to give the shareholders the benefit of their experience and of their knowledge of the mine by compulsory semi-annual statements in connection with affairs generally at the mine. They should in fact give a definite idea of what the shares are actually worth after ample provision is made for the replacement of capital and for paying, say 10% interest. The directors or consulting engineers should also be compelled to show how their valuation is arrived at so as to enable shareholders to judge for themselves whether their conclusions are sound.

Out of respect for the powerful arguments which must naturally exist in support of all established methods, the writer would like it to be understood that the object of this article is merely to secure a general expression of opinion as to whether it is possible, or, rather, advisable, to impart a heathier tone to the mining industry by adopting reforms such as suggested herein. In other words, although of the opinion that the present methods are unfavorable to the investor, it is quite possible that the suggested methods for reducing the speculating element in mining to a minimum, may be considered as merely so many flies in an ointment which although undoubtedly injurious to many, may after all be more fit for general use than any other preparation. On the other hand if "amortization funds" are recognized and required by law in other countries, why not in Canada?

(To be continued.)

# TRETHEWEY ANNUAL REPORT.

**Consulting Engineer's Report.**

Toronto, Feb. 6, 1913.

The President and Board of Directors,
Trethewey Silver-Cobalt Mine, Limited,
Toronto, Ontario.

Gentlemen,—Herewith I beg to submit report of operations of the Trethewey Silver-Cobalt Mine, Limited, for the year ending December 31st, 1912.

**Shipments in 1912.**

| | Net Dry Weight Lbs. | Oz. Silver per Ton. | Total Oz. Silver. | Gross Value. | Net. Returns. |
|---|---|---|---|---|---|
| To Orillia | 48,097.0 | 1,010.0 | 24,505.42 | $ 14,341.80 | $ 13,359.14 |
| To Deloro | 859,561.5 | 1,255.5 | 539,605.51 | 331,651.79 | 307,768.46 |
| To Denver A. S. & R. Co. | 234,374 | 237.5 | 27,828.95 | 17,533.78 | 14,105.41 |
| To London (Bullion) | ........ | ...... | 28,983.24 | 18,165.52 | 17,939.17 |
| Totals | 1,142,032.5 | | 620,923.12 | 381,692.89 | 353,172.18 |

### Summary of 1912 Shipments.

| | |
|---|---|
| Total ounces of silver in shipments...... | 620,923.12 |
| Gross value of shipments in 1912 ....... | $381,692.89 |
| Net cash returns from shipments in 1912 | 353,172.18 |
| Aver. price at which silver was paid for | 61.47 per oz |
| Average net cash return, per ounce silver shipped ........................ | 56.89c. |

### Milling.

During the year $8,197.84 was spent on alterations in the mill and charged to operating account. Besides this amount $4,789.02 was spent in additions to building and equipment. The object of alterations and additions was to increase capacity, to reduce the time lost in break-downs of machinery and to ensure a better recovery of silver from the ore. These alterations were made gradually without interfering with the steady production from the mill, and are now practically completed.

### Mining.

Development. The amount expended on development for the year was $50,790.65 for which a total of 3,885.5 lineal feet of development and exploratory work was done, besides 275 cubic yards of sation and grade cutting incidental to development.

### Summary of Development to Date.

| Year | Shafts. | Drifts and Cross-cuts | Winzes and Raises | Tl footage per year | Tl footage to date |
|---|---|---|---|---|---|
| 1906 and 1907 ...................... | 383 | 2,099 | 217 | 2,699 | 2,699 |
| 1908............................. | 0 | 1,711 | 360 | 2,131 | 4,830 |
| 1909............................. | 213 | 2,688 | 268 | 3,169 | 7,999 |
| 1910............................. | 43 | 3,010 | 226 | 3,279 | 11,278 |
| 1911............................. | 102 | 2,801 | 168 | 3,071 | 14,349 |
| 1912............................. | 79 | 2,950 | 856.5 | 3,885.5 | 18,234.5 |

In conenction with the development work a thorough examination of the mine was made during the summer and a system of records started which inventories the "positive" ore at the end of each month. The following table gives a summary of the tonnage of positive ore on hand at the end of each month, dating from August 31st.

### Positive Ore Reserves and Development.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Aug. 31 .......... | 4980 | 3757 | 23,784 | 32,521 | 2,246 | .. | 541.5 | .. |
| Sept. 30 .......... | 4866 | 3428 | 22,955 | 31,249 | 2,474 | 1,202 | 543 | 2.21 |
| Oct. 31 .......... | 5278 | 3168 | 22,164 | 30,610 | 2,700 | 2,061 | 603 | 3.42 |
| Nov. 30 .......... | 6422 | 2997 | 21,325 | 30,744 | 2,727 | 2,861 | 436.5 | 6.55 |
| Dec. 31 .......... | 6413 | 3825 | 20,934 | 31,172 | 2,284 | 2,712 | 409.5 | 6.62 |

As shown by the foregoing table, the balance between new ore developed and the ore extracted has held up fairly well during the last four months of the year for which figures are available.

The average rate at which development work placed new ore in sight during the last four months was 2,209 tons per month.

The greater part of the development work was done in the south-east quarter of the property that is tributary to No. 2 and No. 5 shafts. This work has continued to yield good results and several small veins were found which gave a good grade of milling ore. In other cases the extensions or parallel branches of older veins were discovered, the working of which was very profitable.

The No. 6 shaft was sunk to the second level and some exploratory work done on the east central portion of the property in conglomerate. While a strong vein with a calcite filling exists at this point, the work done on it has so far not yielded any ore.

With the exception of a small amount of cross-cutting done during the first three months of the year, no development work was done in the north-east section of the property from No. 4 shaft. There are three veins in this section close to the T. & H. B. Co.'s boundary, and, while no 'positive' ore reserves from this section are included in the estimates, some exposures of good veins exist in pillars left in the old stopes, and the chances of finding other veins are favorable.

Ore Reserves.—The total amount of "positive" ore in sight in the mine, blocked out, at the end of 1912 was 6,413 tons with an average silver content of about 28 ounces per ton. In addition to this there were 3,825 tons of ore broken in the stopes averaging about 26 ounces per ton, and 20,934 tons of broken ore on the surface dumps averaging 15 ounces per ton, all of which may be considered "positive" ore.

In the above estimate of Ore Reserves no allowance has been made for ore not thoroughly blocked out, nor for ore on dumps not sampled and measured.

A change of management was made in the middle of the year which involved numerous changes in the personnel of the staff at the mine. Considerable credit is due Mr. H. G. Young, who has done excellent work since his appointment as manager.

I have pleasure in submitting herewith Mr. Young's report.

Yours very truly,
D. L. H. FORBES,
Consulting Engineer.

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### Manager's Report.

Trethewey Silver-Cobalt Mine, Limited,
Mine Office, Cobalt, Ont.,
February 4, 1913

Mr. D. L. H. Forbes, Consulting Engineer,
Trethewey Silver-Cobalt Mine, Ltd.,
306 Manning Chambers,
Toronto.

Dear Sir,—I beg to submit the following report of operations at the Trethewey Mine for the year ending December 31st, 1912:

### Development.

During the year $50,790.65 was spent on development, and 3,885.5 lineal feet of work was accomplished, made up as follows:

| | Feet |
|---|---|
| Drifting | 2072.5 |
| Cross-cuts | 877.5 |
| Raises | 788.5 |
| Winzes | 68.0 |
| Sinking | 79.0 |
| Total | 3885.5 |

In the cast of this work is included 250 cubic yards of station cutting and 25 cubic yards of grading.

### (1) S.W. Section, Near No. 5 Shaft.

(A) First Level.—In this section the north branch of "D" vein was picked up, and an ore chute developed 75 feet in length and about 40 feet vertically. The vein is one to two inches wide of high grade ore, and the wall rock carries good milling values. Some stoping was done during the year on this vein, which gave us excellent ore.

(B) Second Level.—In this section the "D" vein was developed by a winze below the first level to the Keewatin-Conglomerate contact and drifted on for a length of about 60 feet. This work gave us an excellent grade of ore. The vein is one to two inches wide.

"H" vein. This vein was developed by raises from the second sub-level. It is two to three inches wide of medium ore. The ore chute developed was about 60 feet long and 40 feet in depth. Considerable stoping was done here during the year, with good results.

### (2) East Section, Near No. 2 Shaft.

(A) First Level.—The continuation of main vein was picked up west of "S" vein, and developed for a length of about 140 feet and 30 feet vertically. We obtained from this work a very good grade of milling ore on which no stoping has been done as yet. A parallel vein called "G" vein, which joins the main vein, was opened up for a length of 60 feet and 30 feet vertically. This gave us a very good grade of milling ore, which still remains intact.

"E" vein, parallel to "S"—This vein was drifted on for 80 feet, and a raise put up about 40 feet. The ore was very good. No stoping was done here.

"S" Vein.—A small amount of milling ore was developed on this vein above the first level by a series of raises.

No. 1 vein south, off main vein and Nos. 2 and 3 to the north of main vein were developed, and gave us a good grade of milling ore from small ore chutes.

(B) Second Level.—On this level vein No. 151 was picked up from a cross-cut. A small amount of development was done on it by a raise to the first level, a distance of about 40 feet. The vein is about an inch wide of high grade ore, and development to date looks very promising.

South Extension of No. 10 ein.—This vein, although small, gave us an excellent milling ore in the development done on it. The ore chute is about 50 feet long and 30 feet vertically.

### (3) Central Section.

No. 6 Shaft.—This shaft was sunk during the year to the second level, and approximately 450 feet of drifting was accomplished on the "mill fissure" vein, 100 feet of which was one on the first level and 350 feet on the second level. This vein is a wide calcite vein which at first gave promise of producing ore, but developments proved disappointing. We also did about 225 feet of cross-cutting from this vein to the south and found nothing.

### (4) North Section.

Considerable cross-cutting was done in the early part of the year on the second level to the south in No. 4 shaft workings. No veins were encountered. No work has been done in this section during the last nine months. However, this section gives promise of producing considerably more ore.

### Acreage.

The Trethewey Mine consists of approximately 40 acres of which is made up of Keewatin formation and very shallow conglomerate, in which no values have been found. The remaining twenty-five acres is composed of conglomerate. About 12.5 acres of this productive conglomerate formation has been developed. The remaining 12½ acres is so far unexplored.

### Compensation to Miners.

During the last six months we have introduced the contract system of labour as far as possible. This has given us very good results. We find that the miners make more money, and take more interest in the work and are more contented, while the company on the whole gets cheaper work done and better results.

### Boarding Camp.

In October we closed down the boarding camps. We found it very difficult to operate these without a constant loss of $300 or $400 per month to the company. They also necessitated a great deal of attention from the office in order to run them economically. Our proximity to the town enabled us to do this without any great inconvenience to the miners, and we find the present arrangement much more satisfactory to all concerned.

### Accidents.

I regret very much to report to you the large number of accidents which have occurred on this property during the last year. Fourteen were minor accidents which might have happened in almost any operation. However, a number of them were more serious and one fatal. Twenty accidents occurred altogether. It is the constant endeavour of the management to reduce these to a minimum.

### Changes in the Mill.

During the last six months it was found necessary to make a number of additions and changes to the mill plant. During October and November we installed a complete return heating system, which is working out very economically. Our consumption of coal for heating the mill and drying concentrates is about a ton per day. We also built a new dry house for drying and storing mill concentrates. We also erected a tailings stacker in order to pile up our mill tailings and hold them on the property. At present we are altering the rock crushing plant in order to make it more economical of operation and to do better crushing, which will help out our mill tonnage.

I wish to thank the staff and employees for their willing and hearty co-operation with the management towards obtaining good results.

Yours truly,
H. G. YOUNG,
Manager.

# OCCURRENCE, DISTRIBUTION AND UTILIZATION OF BISMUTH ORES*

## BISMUTH MINERALS.

Bismuth minerals are not of very frequent occurrence, and they are usually found only in small quantities. The localities at which they are found in sufficient abundance to constitute workable ores of bismuth are few, and they rarely if ever occur in such a degree of purity that they can be worked for bismuth alone, the bismuth usually being one of several products obtained.

The minerals of chief importance as constituents of workable bismuth ores are native bismuth and bismuthinite. Bismite and bismutite also occur in considerable quantities. Other minerals containing a high percentage of bismuth are bismutosphaerite (carbonate) ,pucherite (bismuth vanadate), uranosphaerite (bismuth uranate), guanajuatite (bismuth selenide), tetradymite (bismuth telluride) as well as a considerable number of double sulphides containing lead, copper or silver. Bismuth also occurs as a natural alloy with gold, the composition of which corresponds to the formula $Au_2Bi$, as in maldonite, found at Maldon, Victoria, Australia. It also occurs alloyed with silver in chilenite, found in the San Antonio mines, Potrero Grande, in Copiapo, Chile. These minerals, however, so far as is known at present, are comparatively rare and of no economic importance as constituents of bismuth ore.

The following is a brief description of the more important ore-minerals of bismuth referred to above:

Native bismuth is a greyish-black heavy mineral the freshly fractured surface of which shows a white metallic lustre with a somewhat pinkish tinge. It is usually found in lamellar or granular masses, and is very brittle and sectile. Its specific gravity varies from 9.6 to 9.8. Native bismuth occasionally contains traces of other elements, notably arsenic, sulphur, and tellurium.

Bismuthinite, or bismuth glance, bismuth sulphide ($Bi_2S_3$), is a lead-grey brittle mineral, having a specific gravity of about 6.5, a hardness of 2, and a grey streak. It crystallizes in the orthorhombic system, is readily fusible and sectile, and often occurs associated with other bismuth ores, particularly the native metal. It contains about 81 per cent. of bismuth.

Bismite, or bismuth ochre ($Bi_2O_3$), occurs in massive form and is occasionally foliated. It varies in color from grey to yellowish-white, and has a specific gravity about 4.4. It contains about 90 per cent. of bismuth.

Bismutite is a hydrated bismuth carbonate. It is soft and easily crushed, and ranges in colour from white to yellow. The specific gravity varies from about 7.0 to 7.5 and hardness from 4 to 4.5. The mineral contains about 90 per cent. of bismuth.

Bismutosphaerite is a bismuth carbonate containing little or no water. It occurs in spherical forms with concentric and radiating structure. In colour it varies from bright yellow to dark grey or dark brown, has a hardness 3 to 3.5 and a specific gravity about 7.3 to 7.6. It contains about 90 per cent. of bismuth.

Although the chief bismuth minerals contain high percentages of the metal, the ores as mined seldom contain more than about 10 or 20 per cent.

Bismuth ores sometimes occur in the quartz and pegmatite veins traversing gneisses, granites, porphyries, and slates, and also in a disseminated form in these rocks. The minerals other than those of bismuth most frequently found in bismuth ores are galena, zinc blende, iron and copper pyrites, sulphides of cobalt and nickel, barytes, cassiterite, wolframite, scheelite, molybdenite, and haematite. Antimony, gold, and silver minerals also occur.

## DISTRIBUTION OF BISMUTH ORES.

### Europe.

**United Kingdom.**—This country does not figure in the official returns as a producer of bismuth ores, but occurrences have been reported from several localities. Native bismuth occurs at the Wheal Sparnon mine, Cornwall, in a rich vein at the Atlas mine in Devonshire, and at Carrock Fells, Cumberland. At the last-mentioned locality bismuth sulphide also occurs in quartz, associated with molybdenite and apatite; it is also found in Cornwall at the Botallack mine, near Redruth, at the Lanescott mine near St. Austell, and at the Hedland mine, Gwennap. Bismite occurs at St. Roach and near Lostwithiel, Cornwall. At one time bismuth ores, which occur with copper ore, spathic iron ore an diron pyrites, were obtained from the Fowey Consols mine, near Tywardreath, Cornwall.

**France.**—For some years bismuth ores were obtained at Meymac from a vein in the granite, which gave chiefly wolframite and arsenical pyrites near the surface and increasing quantities of bismuth in depth. The percentage composition of a sample of the native bismuth from this locality is as follows: bismuth 99.00, antimony 0.15, arsenic 0.09, lead 0.41, iron 0.1, sulphur 0.06.

**Austria-Hungary.**—Bismuth ores occur and have been worked in Bohemia, Carinthia, and near Salzburg. Bismuth telluride occurs in the Banat at Cziklova and in the gold and silver mines of Rezanya, Small quantities are won from the Joachimsthal uranium ores.

**Germany.**—In the past, bismuth ores have been obtained from many localities in Germany and for many years the greater part of the world's output was obtained from Saxony. One of the most important deposits in the latter State is that of Schneeberg, which consists of large masses of granite surrounded by mica schists and clay slates, the mineralized veins usually being found in the latter. A variety of lodes occur; the bismuth ores are generally found in the cobalt veins, which are numerous, and contain quartz, hornstone, cobaltine, native bismuth, pyrites, galena, pyrargyrite, native silver, and other minerals. At Altenberg bismuth glance and native bismuth occur in quartz veins which traverse the "zwitter," a dark-coloured rock composed of quartz and mica, and containing a small quantity of finely divided tinstone. The bismuth ores are associated with iron and copper pyrites, wolframite, molybdenite, fluorite, and other minerals.

In the neighbourhood of Johanngeorgenstadt ores of bismuth are found along with those of silver and cobalt, in the vicinity of the metalliferous greenstones, which traverse the granite.

### Australian Commonwealth.

**Victoria.**—Bismuth ores are stated to be found in some quantity among the deposits of Wombat and

*A paper published in the Bulletin of the Imperial Institute.

Snowy Creeks, in the north-eastern district of Victoria. The ores also occur in reefs at Moliagul and Kingower, in Gladstone; Linton, in Grenville; St. Arnaud and Maldon (The Economic Minerals and Rocks of Victoria. A. E. Kitson, Melbourne: Victoria Department of Mines, 1906). During 1910 deposits were discovered at Round Hill, Bendoc, in East Gippsland, containing wolframite and bismuth ore in payable quantities, and several small parcels of ore were marketed. The prospects are said to be encouraging, but further development work will be necessary in order to determine the value of the deposit (Ann. Rep. Sec. Mines, Victoria 1910, pp. 26, 131).

**New South Wales.**—Bismuth and its ores have been found in many places in this State, but the production during recent years has practically all taken place from two localities: Kingsgate, near Glen Innes, and Whipstick, near Panbula. During the period 1880 to 1910, 527 tons of bismuth ore, valued at £125,527, were exported from New South Wales. The Kingsgate deposits are situated at Yarrow Creek, about eighteen miles east of Glen Innes. Geologically, the country consists of granites and indurated claystones of Carboniferous age. The bismuth deposits are found in nearly circular pipe-veins, which occur near the junction of the granite and claystones and dip in an easterly or north-easterly direction at an angle of about 30°. These pipe-veins vary from 10 ft. to 50 ft. in diameter, several often uniting as they are traced downwards. The gangue in the pipes consists of quartz, containing molybdenite in large crystals and occasionally wolframite and mispickel. Gold and silver are usually present in variable amounts. Near the surface the bismuth ore, which is less plentiful than the molybdenite, occurs as the oxide and carbonate in the joint fissures of the quartz. At greater depths native bismuth and the sulphide are found.

The pipe-veins contain from 0.5 to 5.0 per cent. of bismuth. An average sample of the ore-stuff yielded: metallic bismuth, 2.6 per cent.; gold, 8 dwts. per ton; silver, 3 oz. 5 dwts. per ton. The concentrated ore had the following composition: metallic bismuth, 69.3 per cent.; gold, 4 oz. 1.5 dwt. per ton; silver, 57 oz. 3 dwt. per ton.

The Whipstick deposits, situated about fourteen miles west of Panbula, at one time produced nearly all the bismuth ore obtained in New South Wales. The deposits are very similar in character to those of Kingsgate described above, except that the filling of the pipes here consists of quartz and felspar, with a little mica and some garnet rock. Wolframite is generally absent.

The ore, after being roughly hand-picked, contains on an average 4 per cent. of bismuth and is sent to Sydney for concentration and reduction, the wet process, described later, being usually employed for the latter purpose. Bismuth ores have been found in many other localities in this State. For an account of these see Mineral Resources of New South Wales, by E. F. Pittman. (Sydney: W. A. Gullick, 1901).

**Queensland.**—For many years past this State has produced varying quantities of bismuth ore. Recently the chief producing area has been the Biggenden district, where bismuth occurs associated with magnetic iron ore. Other producing deposits occur in the Herberton and Chillagoe districts, and small quantities are occasionally obtained in the Etheridge and Star River districts. An occurrence in the Degilbo district has been worked to some extent. The lode, which is 3 ft. wide, is said to outcrop in a position favourable for working. The ore consists of bismuth carbonate, sulphide and telluride, and contains varying amounts of gold, silver and copper, and occurs in fissures. The country rock is an altered slate intersected by porphyry dykes. A sample of the picked ore contained 3.6 per cent. bismuth, 12.1 per cent. copper, and 5 oz. of silver per ton. The Glen bismuth mines of the Herberton district have already been referred to in this Bulletin (1912, 10, 330).

**South Australia.**—Although during the period 1867 to 1876 about 71 tons of bismuth ore, valued at £16,679, were obtained from South Australia, no production was recorded from 1876 to 1906; and during recent years the quantity raised has been insignificant. Bismuth ore, in the form of sulphide, carbonate, oxide, and native metal, has been found in at least 18 mines in this State. An account of these occurrences, together with a record of the amount of development work done, which in some cases has been considerable, will be found in the Record of Mines of South Australia, by H. Y. L. Brown (Adelaide: C. E. Bristow, 1908).

**Tasmania.**—There is a small but steadily increasing production of bismuth ore from Tasmania, the output during recent years being almost entirely obtained from the Shepherd and Murphy mine in the Middlesex district. The ore here occurs in quartz-topaz veins in a metamorphic limestone, together with wolframite and cassiterite. It also occurs at other mines in this district. Bismuth ore has also been located at Mount Black in quartz, associated with gold, wolframite, and other minerals. A sample of the ore contained 7.4 per cent. bismuth, 0.8 per cent. copper, and 0.95 oz. of gold per ton.

In the Heemskirk Mountains bismuth is said to occur in lodes with tin and silver, and near Ringville a number of lodes have been worked yielding rich argentiferous bismuthic fahl ores.

### Asia.

**India.**—Very few occurrences of bismuth ore have been recorded in India. Bismutite is said to occur with antimony ore in the range of hills between the Attaran and Maulmain rivers, Tenasserim. Bismuth also occurs in small amounts, with the copper ores of Hazaribagh and Singhbhoum, Bengal, whilst certain ores from Nepal carry 24 per cent. of bismuth and 14 per cent. of copper. The copper ores from the Mundi State, Punjab, are also said to contain bismuth (S. C. Rudra, Trans. Amer. Inst. Min. Eng., 1903, 34, 81).

**Japan.**—At one time bismuth was extracted from the ores of Nishizawa district, Hida, and small quantities of ore are produced from mines in Rikuchu and Mimasaka. The ore is known to occur in many other localities, a full list of which will be found in Mining in Japan (Tokio Bureau of Mines, 1909).

**Sumatra.**—Bismuth ore is stated to occur in commercial quantities near Lake Toba.

### Africa.

**Rhodesia.**—All the commoner ores of bismuth enumerated on pp. 628, 629 have been recorded from Rhodesia, the chief localities being Mazoe and Lomagundi. Bismuthinite occurs as an impregnation together with molybdenite and pyrrhotite disseminated through syenite at the Hay mine, Mazoe. The ore is worked for its gold, but the bismuth does not appear to be recovered.

Bismutite has been found in notable quantity in gold-bearing quartz veins at Victoria and Lomagundi. Native bismuth occurs in the Hartley district and bismuth ochre at Gadzema.

**Transvaal.**—Bismuth telluride is said to occur about twenty miles north-east of Pretoria and bismite in the auriferous deposits of the Lydenburg district.

**German South-West Africa.**—Native bismuth is found mover a large area in the Knisib district of Damaraland, in quartz veins which traverse a mica schist. The metal is often accompanied by bismuth ochre, and by gold, silver, and copper ores.

### America.

**Canada.**—Native bismuth is said to be of fairly common occurrence in the sluice-boxes of the alluvial gold workings of Highet Creek, a tributary of the Stewart River, Yukon. The same mineral also occurs in quartz veins with smaltite, in the Montreal River district. Bismutite occurs at New Ross, Lunenburg county together with ores of tin, tungsten, and molybdenum in pegmatite and aplite dykes. The mineral also occurs in quartz veins in an altered granite near Kewagama Lake, Quebec; also near Lyndock and at Clarendon, Ontario.

**United States.**—Only during the last few years has bismuth been produced in the United States, and at the present time there is very little bismuth ore raised as such, the bulk of the bismuth obtained being recovered from the refining of other metals. Amongst these sources may be mentioned the anode slimes from the electrolytic refining of copper at Chrome, New Jersey, and the Betts electrolytic lead process worked at Grasselli, Indiana, where the lead ores from the Tintic district are smelted. At Leadville, Colorado, ores carrying 7 to 14 per cent. of bismuth have been obtained. Deposits near Mesa and Phoenix, in Arizona, have been developed to some extent. Small shipments containing 11 to 25 per cent. of bismuth have been made from San Andreas Mountain section, New Mexico.

**Mexico.**—High-grade bismuth ore has been obtained from Sinaloa and Sonora. The Rey del Bismuto mine in Sinaloa yields a large quantity of ore containing bismuth 2 per cent., iron 33, silica 31, copper 0.9, and alumina 12.5. A smelting trial gave 80 to 90 per cent. of the theoretical yield of bismuth. Rich oxidized ores have been obtained near Ojo Caliente, Chihuahua. Bismuth ochre occurs in the nickel-cobalt deposits in Jalisco.

**Brazil.**—In Entre Rios, Minas Geraes, deposits of metallic bismuth have been located. The ore is stated to carry less than 7 per cent. of impurity.

**Peru.**—Deposits have been worked near San Gregorio, Cerro del Pasco. In San Mateo, Lima, the mineral chiviatite, a sulphide of lead and bismuth, has been found; and it also occurs with bismuthinite in Yauli, Lima, and Juaja, Junin.

**Bolivia.**—At the present time a large proportion of the bismuth ore produced is obtained from Bolivia. The most important deposits are situated at Tasna, where the ores, which include the native metal, carbonate, sulphide and ochre, are said to carry from 20 to 30 per cent. of bismuth, 10 to 17 per cent. of iron, 9 to 12 per cent. of sulphur, and traces of antimony, silver, and lead. The ores occur in quartz veins in slates at an altitude of 5,100 ft. The ore is smelted at Quechisla, the products being metallic bismuth and a copper matte carrying 5 to 8 per cent. of bismuth. The matte is re-smelted and about half the bismuth contained in it is recovered. The second matte is treated by the "wet process" described later.

### Dressing of Bismuth Ores.

At first sight it would appear that the concentration of bismuth ores, owing to their high specific gravity, should present few difficulties. Owing, however, to the extreme brittleness of the minerals, they form slimes very readily when crushed, and so considerable loss occurs during dressing. The finely powdered mineral, even if saved by suitable slime treatment, is objectionable, as losses occur by "dusting" and also during calcination by reason of the ready volatility of bismuth. These difficulties, combined with the fact that many bismuth mines are only operated on a small scale, have caused the question of the effective concentration of bismuth ores to be much neglected. Recently more attention has been paid to the subject, and magnetic separation has been successfully employed in some cases as in the separation of wolframite.

A method of concentration formerly employed for ores containing native bismuth, or the sulphide, is that of liquation; but, owing to the losses involved in the process, it is now not often used. The process consists in heating the ore in inclined iron tubes closed at the top end, the lower end being fitted with a grating and arranged to deliver the molten matter into a graphite crucible containing a layer of carbon. The method of concentration sometimes employed in New South Wales is as follows: After being hand-picked the ore is crushed to ¼-inch size, and then treated in a sluice-box having a fall of 9 in. in 12 ft., being worked meanwhile with a shovel and birch broom. By this means a concentrate carrying 20 per cent. of bismuth is obtained which is treated again in a similar sluice-box, and, after removal of the larger pieces of molybdenite by hand, a product containing 50 to 60 per cent. of bismuth is obtained.

According to the Annual Report of the Minister of Mines for Queensland (1909, p. 95) the mill in operation in the Biggenden district (see this article) consists of a stonebreaker, sizer, and two 5-foot Huntington mills and the concentration plant of two Frue vanners, 1 card, and 2 Wilfley tables and an electromagnetic separator.

### Extraction of Metallic Bismuth.

The concentrated ore is usually submitted for the extraction of the metal to one or all of a series of operations, which may be roughly divided into roasting, smelting and refining.

Roasting.—The ores containing arsenic, sulphur, or antimony, before being smelted, are crushed to pass a sieve having four meshes to the linear inch and then roasted with carbon. As neither "heap" nor "kiln" roasting is suitable for bismuth ores, the operation is best carried out in a long hearth, reverberatory furnace; a furnace having a hearth 16 ft. by 9 ft. is suitable for treating about six to seven tons of material per day. The charge is subjected during heating to constant rabbling to prevent the mass agglomerating and to assist the volatilization of the arsenic and antimony.

Smelting.—This is done either in crucibles or in a reverberatory furnace, the latter being the more economical unless small scale operations are intended. Descriptions and plans of suitable furnaces will be found in an article in The Mineral Industry (1907, 16, 112). Owing to the readily volatile character of bismuth the charge must be of a very fusible character, and usually contains 10 to 20 per cent. of sodium carbonate, together with oxide of iron, lime, and old slags in suitable proportions, and 3 to 5 per cent. of crushed coke or charcoal. The charge in the furnace is raised to a red heat, and when the bismuth is reduced the temperature is rapidly raised to a white heat. As soon as the contents of the furnace are quite fluid the charge is run into iron moulds, which are often provided with a taphole at the bottom to permit of the still liquid bismuth being run off as soon as the top slag has solidified. This crude bismuth contains most of the lead, gold, silver, and antimony, and a small proportion of the arsenic and copper which were present in the original charge. The copper, for the most part forms a matte, whilst the nickel and cobalt form a speiss with part of the arsenic. Both the speiss and matte contain appreciable quantities of bismuth.

Several "wet" processes of extraction have been employed for the treatment of oxidized bismuth ores. One which was used at Meymac, France, for a number of years is as follows: The finely crushed ore is heated in earthenware pans with strong hydrochloric acid and the solution filtered from the insoluble gangue. By diluting this solution with a large excess of water the bismuth is precipitated as the oxychloride, which can be converted into the metal by treatment with iron or zinc. The method now usually employed at Meymac is to precipitate the bismuth from the acid solution by means of metallic iron and then melt the precipitated bismuth in a plumbago crucible under a layer of carbon.

Refining.—The crude bismuth produced by any of the above processes is not usually sufficiently pure to place on the market. Owing to the small affinity that bismuth has for oxygen, a process similar to that employed for refining lead is used. The molten bismuth is exposed for some time to the influence of atmospheric oxygen, which causes any tin, arsenic, antimony, sulphur, zinc, iron, etc., to be either volatilized or separated as "dross."

The percentage composition of crude and refined bismuth as produced in some of the most important centres is shown in the following table.

| | Crude Bismuth. | | | Refined Bismuth. | |
|---|---|---|---|---|---|
| | Australia. | Bolivia. | Peru. | Saxony. | |
| Bismuth. . . . . | 96.2 | 99.05 | 93.57 | 99.74 | 99.98 |
| Antimony. . . . . | 0.8 | 0.56 | 4.57 | — | — |
| Arsenic. . . . . . | trace | — | — | 0.01 | trace |
| Copper. . . . . . . | 0.5 | 0.26 | 2.06 | 0.02 | 0.03 |
| Lead. . . . . . . . | 2.1 | — | — | 0.11 | 0.06 |
| Iron. . . . . . . . . | 0.4 | — | — | trace | trace |
| Sulphur. . . . . . | — | — | — | 0.04 | — |
| Silver. . . . . . . . | — | 0.08 | — | 0.07 | — |

## Properties and Uses of Bismuth.

Bismuth is a silver white, lustrous metal, having a specific gravity 9.83 and melting at 270°C. In appearance it somewhat resembles antimony, but has a foliated texture.

Molten bismuth, on cooling, expands about 2.3 per cent. of its volume, a property which makes it of value in alloys used for the production of stereotype plates. The molten metal can be cooled 6°C below its solidifying point and still remain liquid, but when solidification occurs it is accompanied by a rise in temperature. The metal is not affected by dry air, but in the presence of moisture it becomes coated with a reddish powder. When raised to a red heat in air it burns with a bluish flame producing the yellow oxide, $Bi_2O_3$. Metallic bismuth has a very low thermal conductivity compared with silver, the ratio of the two being 1.8:100. Owing to its low melting-point, the metal is much used in fusible alloys; the composition of certain of these is given in the following table:

| Name of alloy. | Melting point | Percentage composition Bismuth. | Tin. | Cadmium. | Lead |
|---|---|---|---|---|---|
| Rose's. . . . . | 94°C. | 50 | 25 | — | 25 |
| Wood's. . . | 66°C.-70°C. | 50 | 14 | 12 | 24 |
| Lipowitz'. . . | 60°C. | 50 | 13 | 10 | 27 |
| Newton's. . . | 94°C. | 20 | 30 | — | 50 |

These figures show that the replacement of a portion of the tin by cadmium considerably lowers the melting point of the alloy.

An amalgam of bismuth and mercury with or without the addition of lead and tin is stated to be sometimes used for silvering mirrors.

A small quantity of bismuth, not exceeding 0.25 per cent., is a component of many anti-friction metals. Certain electric fuses have the composition: bismuth 50, cadium 15, lead 20, tin 21 parts. A solder used by pewterers consists of bismuth 25 per cent., tin 50 per cent., and lead 25 per cent.

Stereotype plates often contain bismuth; in one case the percentage composition is as follows: bismuth 15, lead 70, antimony 15.

Bismuth oxide ($Bi_2O_3$) has been used as one of the constituents of optical glass, and also for colouring porcelain and other purposes.

The basic subnitrate (oxynitrate) was at one time used as a cosmetic, but is now largely displaced by the cheaper zinc white.

Bismuth compounds also find considerable employment in medicine, the chief of these being the oxide, oxycarbonate, oxynitrate, and salicylate.

## Commercial Value of Bismuth Ores.

Owing to the fact that the principal European bismuth smelters are members of an association which regulates the price and output of the metal, there is practically no competition amongst buyers, and the market is very restricted.

Ores containing less than 10 per cent. of bismuth are not usually saleable. As is usually the case with metallic ores, those containing a high percentage of the metal realize a higher price per unit than those of lower grades. No definite information can be given as to the value of bismuth ores, but the following statement, based on data given in The Mineral Industry (1907, 16, 118), may be of service in affording approximate estimates of value.

If the value of an ore containing 10 per cent. of bismuth is taken as unity, the value of a 15-per-cent. ore would be 1.7, a 20-per-cent. ore 2.3, a 30-per-cent. ore 3.7, a 40-per-cent. ore 5.0, and a 50-per-cent. ore 6.7. With metallic bismuth at 6s. 8d. per lb., the value of a unit varies from £18 15s. to £20 16s., e.g., an ore carrying 15 per cent. of bismuth would be worth £31 17s. 6d. to £35 7s. per ton. These prices are c.i.f. smelting works. Gold and silver in the ore is either not paid for at full rates or a treatment charge is made.

Other constituents present in the ore may also influence its selling value. Copper, iron, and arsenic are stated to be objectionable (Mineral Industry, 1909, 18, 74). Up to 10 per cent. of copper is permitted in an ore carrying 25 per cent. of bismuth, and up to 2 per cent. in ores carrying 6 per cent. or less of bismuth. Up to 10 per cent. of iron is permitted; arsenic must not exceed 12 per cent.

Early in 1905 the price of bismuth was 9s. per lb., but during the year it was reduced to 5s.; in 1907-9 the price was 6s. 6d.; the current value is 7s. 6d. per lb.

#### Production of Bismuth Ores.

Statistics of production of bismuth ores in recent years, so far as they are available, are given in the following table:

Specimens of bismuth ores from the following localities in the British Empire are shown in the Public Exhibition Galleries of the Imperial Institute.

Queensland—Erin Mine, Eidswold; Cloncurry; Mount Biggenden; Chowney Creek; Kaboonga, near Kilkivan; Mount Shamrock, Maryborough.

New South Wales.—Mount Gipps, Barrier Range; Jingera, Co. Auckland; Kingsgate, New England.

Tasmania.—Middlesex district.

| | 1908. | | 1909. | | 1910. | | 1911. | |
|---|---|---|---|---|---|---|---|---|
| | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. |
| | *Metric tons.* | £ | *Metric tons.* | £ | *Metric tons.* | £ | *Metric tons.* | £ |
| Germany[1] | 8,535 | 33,000 | 10,388 | 33,700 | 10,313 | 31,450 | not available | |
| Italy[2] | — | — | 12 | 48 | — | — | | |
| Norway | 12 | 330 | — | — | 5 | 1,377 | | |
| Spain | 96 | 1,920 | 78 | 1,621 | 53·5 | — | | |
| New S. Wales | 9 | 2,017 | 9 | 1,624 | 6·0 | 2,004 | 8 | 1,800 |
| Queensland[3] | 23 | 10,595 | 10·5 | 2,771 | 21 | 9,708 | 10 | 5,525 |
| S. Australia | 2 | 300 | — | — | — | — | — | — |
| Tasmania | 3·8 | 462 | 2·9 | 980 | 11 | 4,249 | 14·5 | 5,758 |
| United States[4] | 2·3 | — | No returns | | 41 | — | not available | |
| Bolivia | 1160 | 24,552 | 311 | 153,873 | 237 | 116,086 | | |
| Peru | 9 | 1,908 | 30 | 9,772 | 24 | 7,556 | | |

[1] *Bismuth, nickel, and cobalt ores.* [2] *Bismuth, silver, cobalt, and gold ores.*

[3] *Also produces mixed bismuth and wolfram concentrates. In* 1911 *the quantity was* 129 *tons, valued at* £11,564.

[4] *Metallic bismuth from refining of lead and copper ores.*

# THE ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE

The final programme for the Annual Meeting of the Institute, which will be held in Ottawa on March 5th, 6th, and 7th, next, is as follows:

#### Wednesday Morning.

The meeting will be opened at 11.00 p.m. by H.R.H. the Governor-General. The President, Dr. A. E. Barlow, will then deliver an address. This will be followed by the consideration of proposed amendments to the By-laws; and by the presentation of mineral statistics for the year 1912 by Mr. John McLeish, of the Mines Branch of the Department of Mines, Ottawa; by Mr. T. W. Gibson, Deputy Minister of Mines of Ontario; by Mr. T. Denis, Superintendent of Mines of Quebec; and by Mr. W. Fleet Robertson, Provincial Mineralogist of British Columbia.

#### Wednesday Afternoon.

At this session the papers will be mainly relative to mining industries in the vicinity of Ottawa, and will include the following: "Mica Mining in Canada," by Hugh de Schmid, Ottawa; "Mica Manufacture and Marketing," by S. O. Fillion, Ottawa; "The Origin of Graphite," by John Stansfield, McGill University, Montreal. These papers will be followed by a short lecture by Mr. J. J. Penhale, of Sherbrooke, on "The Evolution of Mining and Milling Asbestos in the Eastern Townships of Quebec."

#### Wednesday Evening.

On Wednesday evening Dr. Henry M. Payne, of New York will lecture on "The Development and Problem of the Yukon." The chair at this session will be occupied by Dr. Alfred M. Thompson, M.P., of Dawson, Y.T., who will introduce the lecturer, and also deliver an address on "The Progress of Mining in the Yukon."

#### Thursday Morning.

The papers at this session will relate more particularly to the metallurgy of the gold and silver ores of the Porcupine and Cobalt districts, respectively. They include: "Cyanide Practise in Canada," by Herbert A. Megraw, New York; "The Metallurgy of the Porcupine Gold Ores," by D. L. H. Forbes, Toronto; "Grading Analyses, and Their Application to Cyanidation, Classification, etc.," by John W. Bell, McGill University, Montreal; "The Measurement of Compressed Air Delivered by the Hydraulic Compressor at Cobalt," by C. H. Taylor, Toronto, and "Notes on Mine Sampling," by G. C. Bateman, Toronto.

#### Thursday Afternoon.

All the papers to be presented at this session will deal with iron mining or metallurgy. They include the following: "Aglomeration of Iron Ores," by N. V. Hansell, New York; "Prospecting the Iron Sands of Natashkwan, Quebec, with the Empire Drill," by G. C.

Mackenzie, Mines Branch, Department of Mines, Ottawa; "The Steel Industry of Nova Scotia," by Thos. Cantley, New Glasgow, N. S.; and "Iron Mining in Cuba," by Chas. F. Rand, New York.

### Thursday Evening.

In keeping with tradition, Thursday evening has been set apart for the annual smoking concert. The programme has been arranged entirely by a local committee, who, while refusing to divulge details, have given assurances that the entertainment will eclipse all former efforts in this direction.

### Friday Morning.

The following papers will be presented: "Recent Advances in our Knowledge of the Sudbury Region," by A. P. Coleman, Toronto; "Money Metal," by Wm. Campbell, New York; "Magmatic Origin of the Sudbury Nickel Copper Deposits," by Reginald E. Hore, Houghton, Mich.; "Some Notes on the Pearl Lake Section of the Porcupine District," by H. G. Skavlem, Aura Lake, Ont.; "Investigations of the United States Bureau of Mines in Metal Mines," by George S. Rice, Pittsburg, Pa.; "State Aid to Mining in Australasia," by H. Mortimer-Lamb, Montreal.

### Friday Afternoon.

"The Clay Deposits of Western Canada," by Heinrich Ries, Ithaca, N.Y.; "Core Drilling," by P. H. Moore, Toronto; "An Economic Investigation of the Coals of Canada," by J. B. Porter, McGill University, Montreal; "The Lignites of Saskatchewan," by R. O. Wynne Roberts, Regina, Sask.; "Prospecting and Washing for Diamonds," by W. J. Dick, Ottawa; "Recent Metallurgical Developments," by Alfred Stansfield, McGill University, Montreal; "The Pulmotor in Mine Rescue Work," by Henry E. Bertling, Toronto.

### Friday Evening.

The annual dinner will be held at 7.30 p.m. The feature this year will be that music is substituted for the usual long toast list, the only speaker of the evening being the Right Hon. R. L. Borden, who will be the guest of honor.

# WHY THE NICKLE PLATE MINE WAS SOLD

By E. Jacobs, Victoria, B.C.

When in Spokane, Washington, last November, I had a talk with Mr. F. A. Ross, formerly general manager for the executors of the late Marcus Daly, of the Nickel Plate group of gold mines, in Hedley camp, Similkameen, and the 40-stamp mill at Hedley, relative to the sale of that property to the syndicate that organized the present Hedley Gold Mining Co. Reflections on Mr. Ross' management of the mines and statements concerning the sale of the property by the Daly interests having been publicly made, I was desirous of hearing the other side of the story. Immediately after my return to Victoria I had to give all my time and attention to the work of preparing the several annual reviews of mining in British Columbia, since published in half a dozen influential mining journals, so had to defer for the time putting in shape for publication what Mr. Ross told me of the circumstances that led to the sale of the property. Quite recently, however, I received a copy of the Northwest Mining News, edited by Mr. L. K. Armstrong of Spokane, and in that journal found printed a copy of a paper on "The Microscope in Mining Geology," by Mr. C. A. Stewart, professor of geology, at the Idaho State University, Moscow, Idaho, and discussion by Mr. Ross of that paper, at the time it was read before the Spokane Local Section of the American Institute of Mining Engineers. I shall not now give a synopsis of Professor Stewart's paper, but shall quote only Mr. Ross' comments, as follows:

"Professor Stewart's paper is timely and to the point. With the passing years we grow more dependent upon practical applications of the principles of economic geology in the search for new ore bodies and too much emphasis, therefore, cannot be placed upon the importance of that science and of all that relates thereto. From Yucatan to the Yukon, our continent has been well-combed by prospectors, ancient and modern, until most of those bonanzas have been located and worked that had their signs sticking out of the ground, as if saying to all who passed that way, 'Here I am, come and get me.' In future, then, the proverbial tenderfoot luck and prospector's grind must give way, in large measure, to logical reasoning and deduction, well exemplified by Parke Channing's brilliant work at Miami.

"In exploratory work, especially, whether of examination prior to purchase or undertaken in the development of ore reserves, the part played by microscopic analysis of rock sections is most important. Yet there are instances in which geological theories must fail in advance of exploratory work and the discovery of 'the law of the camp.' Such instances are those in which detached ore bodies or shoots lie in different planes or horizons, as they do in Nickel Plate mountain, Hedley, British Columbia. Here, the tilted and contorted sedimentaries are penetrated and parted along their bedding planes by spurs and sheets of monzonite that have so altered and silicified the limestones at points of contact as entirely to mask their identity to the naked eye and to cause experienced geologists to classify them as quartzites, by which name they were known for years, before rock sections were made, just as the monzonites were called andesites. Microscopic analysis showed the presence of the critical minerals and indicated deep-seated action, resulting in the formation of true contact metamorphic deposits of arsenical pyrites containing gold and presenting peculiar and unique mining and geological problems as well as a delicate problem in professional ethics and commercial expediency.

"Prior to 1909, when it changed hands, there was but one known ore-bearing horizon on this property, nor was any other discovered until two years later. When, therefore, this known horizon, or contact, showed signs of exhaustion and when systematic surface prospecting and extensive underground exploration had failed to open new ore bodies, a comprehensive plan for development became necessary, and, owing to the absence of guiding indications such as veins, fissures, mineralizing dikes, etc., the preliminary estimates of the possible cost of this work ran very high. Pay-ore might occur anywhere in depth, or nowhere at all. So far as could be foreseen, it meant a detailed exploration of the entire mountain and the odds against finding pay-ore with a minimum of work and expense appeared very great. Moreover, competent geologists had already been consulted and there seemed to be no hope of aid either from analagous reasoning or geological deduction, inasmuch as this formation is unique, according to the best authorities.

"Consequently, without a reasonably positive assurance of success, which could not, of course, be given, the owners were reluctant to authorize the expenditure, especially since it had become necessary to remodel the entire plant owing to the disappearance of free gold with depth. They determined, therefore, to sell, at a profit on their investment, to others who stood ready to purchase on the showing at that time, and to take the very long 'mining chance' that remained. The new owners entered at once upon the necessary expenditures for plant improvement and development, and, after some two years' work, when the old workings were practically exhausted, were very fortunate in finding another ore-bearing horizon or contact, several hundred feet below the lowest of the old workings, thereby prolonging the life of the property and once more proving the fact that long odds sometimes win out.

"Now the ethical question, and the commercial expendiency, involved in this case was this: In cases of grave doubt, should managers advise and encourage heavy expenditures solely on the basis of the 'mining chance,' thereby risking a total loss, or should they advise for safety and an assumed profit? At first sight there would seem to be but one answer to such a question, assuming, of course, that the first duty of a manager to his principals is to protect them from ultimate loss. Yet, as everyone knows, mine owners in general more readily forgive advice that causes heavy loss when ore does not materialize than they do advice that loses them the profit others may make out of ground they once owned, notwithstanding the fact that the percentage of cases under the first condition is vastly in excess of that under the second, as the history of mining conclusively shows.

"It is precisely this peculiarity of human nature that decides many examining engineers, mine managers, and geologists in taking long chances on unduly favourable predictions. It is true that conditions are gradually changing in this respect as regards the heavier mining investors. These men are learning to appreciate conscientious reports and conversative advice, and they value accordingly the services of those who make them or give it. But with the general investing public it is still as it always has been—optimism is expected and demanded and the only unpardonable sin is advice that loses a possible profit that others realize, no matter how long the odds.

"To return then to Professor Stewart's excellent paper—the aids offered by rock sections in exploratory work cited by him would doubtless fail in formations similar to the one just described—at least in advance of exploratory work sufficient to demonstrate the 'law of the camp' if this were possible, which at present writing and in this instance appears doubtful."

# NAMES OF MINERALS

By Wm. Thomlinson, New Denver, B.C.

The following was written for publication in a mining district of British Columbia. It was prove readable as well to some of those interested in minerals and resident in some of the many other mining camps in which The Canadian Mining Journal is read:

Many prospectors and miners have a habit of making rude remarks regarding the technical names of rocks and minerals. They may be justified in doing so, or, perhaps, it may be, that as the Arabs say, "they don't know what they don't know," therefore may be excused.

As a sort of pastime I have looked up this matter of technical names and find that really there is as much "method in the madness" of the mineralogists as in the work of other men who are responsible for the names used in botany, horticulture, pomology, and so on.

Our worthy metal-miners rail at such names as Rhodonite, for a rose-pink mineral, but are respectfully silent when a botanist calls a shrub a Rhododendron; Cauliflower, for a vegetable, and Duchess of Oldensburgh, for an apple, are quietly accepted; but when a miner, who has been some to school, speaks of calcite, bornite, argentite and so on, some proudly practical friend is sure to retaliate with professional words used mostly by sailors, teamsters, and troopers.

More in sorrow than in anger I shall try to show that the technical names for minerals, such as Fluorite, Bornite, Smithsonite, etc., are nearly as appropriate as "Blue John," "Black Jack," "Dry-bone ore," "Horseflesh ore," "Turkey-fat ore," "Spiderleg," and "Mustard" gold.

Upwards of eight hundred different minerals are known to mineralogists and it was evidently "quite a job" to find for them all names not previously taken for use in other branches of science. However, they seemingly did the best they could under the circumstances.

Referring to about two hundred of the commoner economic minerals, the names are mainly formed from the names of places where the minerals were first found; from names of persons who first noted the minerals or proved their composition, or some peculiarity of shape, colour, weight, or other physical property of the mineral.

The following are examples of how the names are derived:

### From Names of Places.

Altaite, telluride of lead, found in the Altai mountains, Russia.

Bauxite, hydrous-oxide of aluminium, at Baux, in France.

Franklinite, an iron-zinc-manganese mineral, at Franklin, New Jersey, U.S.A.

Calaverite, telluride of gold and silver, found in Calaveras county, California.

Muscovite, white mica, first used for windows at Moscow, Russia.

### From Names of Persons.

Sperrylite, arsenide of platinum, after Mr. Sperry, who discovered the mineral at Sudbury, Ontario.

Stephanite silver, antimony and sulphur, "brittle silver ore," after a Grand Duke Stephan of Austria.

Proustite, silver, arsenic and sulphur, "arsenical ruby silver ore," after Dr. Proust, who first noted the difference between this mineral and the antimonial ruby silver ore, Pyrargyrite.

Bornite, copper, iron and sulphur, "peacock copper ore," after Mr. Born, who first determined its composition.

Millerite, Garnerite, Smithsonite, and a large number of others are named in this manner.

### From Forms of Crystals.

Tetrahedrite, "gray copper ore," from two Greek words meaning for faces or sides, the mineral, when crystalized, having a four-sided wedge-like form.

Octahedrite, titanium oxide, similarly because of its eight-sided form.

Orthoclase, potash feldspar, from two words meaning right and cleavage, the mineral splitting or having cleavage lines at right angles.

### From Colour and Other Peculiarities.

Hematite, an oxide of iron, from a Greek word meaning blood, the mineral when powdered has a dark red blood colour.

Rhodontie, manganese silicate, from a Greek word for rose, the mineral has a rose-pink colour.

Azurite, a carbonate of copper, of azure blue colour.

Maganetite, a black oxide of iron, so named because it is highly magnetic.

Barite, sulphate of barium, "heavy spar." Name from a Greek word meaning heavy.

Tungsten, from Swedish words meaning heavy stone, its great weight being noticeable.

Petroleum, derived from the Latin words meaning literally rock oil. Many minerals and economic substances are named in this manner.

Some minerals are named after the principal metal or element found in their composition, as cobaltite, nicolite, bisceuthite, and so on. A number of metals and minerals were known and used ages ago, and in many cases the old Greek, Latin, and other names are still used by chemists and other scientific men. These are examples: Gold, aurum; silver, argentum; copper, cuprum, also chalco, lead, plumbum; iron, ferrum, also sideros; antimony, stibium; tin, stannum; lime, calx. From these are derived such names as argentite, sulphide of silver; cuprite, red oxide of copper; chalcocite and chalcopyrite, two other copper-bearing minerals; siderite, carbonate of iron; stibnite, sulphide of antimony; stannite, sulphide of tin and copper; calcite, "lime spar," carbonate of lime.

It is not assumed that scientific men are entirely blameless in the matter of coining or selecting names for rocks, minerals, etc., but it may be reasonable to remember and consider the size and difficulty of the task of finding such a large number of suitable names.

However, if any fiercely practical prospector or miner will be good enough to furnish a list of, say, 600 short, apt, and easily pronounced names, suitable for rocks and minerals, the writer will be happy to re-forward the same for careful consideration to the next congress of "rock sharps," "mining experts" and mineralogists.

# THE COPPERMINE COUNTRY

By J. B. Tyrrell

(Continued from our last issue.)

After Hearne's visit in 1771 no white man visited the country for fifty years, until Sir John Franklin arrived at the head waters of the river, and then descended and made a survey of it from Point Lake to the Arctic Ocean. Franklin's account of the country is interesting. He states:

"We rejoined our hunters at the foot of the copper mountains, and found they had killed three musk-oxen. This circumstance determined us on camping to dry the meat, as there was wood at the spot. We availed ourselves of this delay to visit the copper mountains in search of specimens of the ore, agreeably to my instructions; and a party of twenty-one persons, consisting of the officers, some of the voyagers ,and all the Indians, set off on that excursion. We travelled for nine hours over a considerable space of ground, but found only a few small pieces of native copper. The range we ascended was on the west side of the river, extending W.N.W. and E.S.E. The mountains varied in height from twelve to fifteen hundred feet. The uniformity of the mountains is interrupted by narrow valleys, traversed by small streams. The best specimens of metal we procured were among the stones in these valleys, and it was in such situations that our guides desired us to search most carefully. It would appear that when the Indians see any sparry substance projecting above the surface, they dig there; but they have no other rule to direct them, and have never found the metal in its original repository. Our guides reported that they found copper in large pieces in every part of this range, for two days' walk to the northwest, and that the Esquimaux come hither to search for it. The annual visits which the Copper Indians were accustomed to make to these mountains, when most of their weapons and utensils were made of copper, have been discontinued since they have been enabled to obtain a supply of ice-chissels and other instruments of iron by the establishment of trading posts near their hunting grounds. That none of those who accompanied us had visited them for many years was evident, from their ignorance of the spots most abundant in metal.

"The impracticability of navigating the river upwards from the sea, and the want of wood for forming an establishment, would prove insuperable objections to rendering the collection of copper at this part worthy of mercantile speculation."

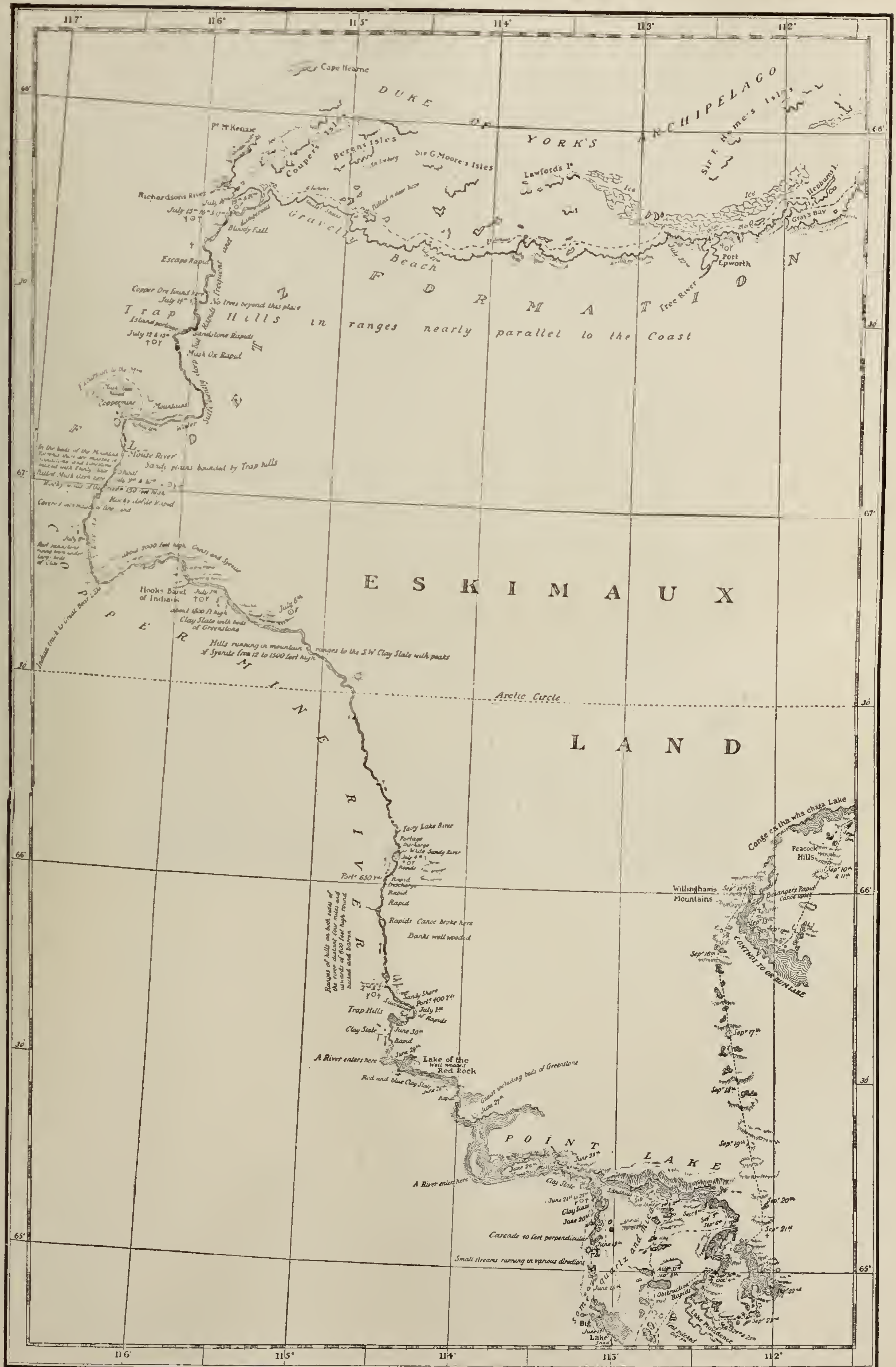
Among the members of Franklin's party was Sir John Richardson, the great naturalist, and his account of it is much more detailed than that given by his chief and is here appended:

"The Copper Mountains appear to form a range running S.E. and N.W. The great mass of rock in the mountains seems to consist of felspar in various conditions; sometimes in the form of felspar rock or claystone, sometimes coloured by hornblende, and approaching to greenstone, but most generally in the form of dark reddish-brown amygdaloid. The amygdaloidal masses, contained in the amygdaloid, are either entirely pistacite (epidote), or pistacite enclosing calc-spar. Scales of native copper are very generally disseminated through this rock, through a species of trap tuff which nearly resembled it, and also through a reddish sandstone on which it appears to rest. When the felspar assumed the appearance of a slaty claystone, which it did towards the base of the mountains on the banks of the river, we observed no copper in it. The rough and in general rounded and more elevated parts of the mountain are composed of the amygdaloid; but between the eminences there occur many narrow and deep valleys, which are bounded by perpendicular mural precipices of greenstone. It is in these valleys, was crystallized in rhomboidal dodecahedrons. We also found some large tabular fragments, evidently portions of a vein consisting of prehnite, associated with calcareous spar, and native copper. The Indians dig wherever they observe the prehnite lying on the soil, experience having taught them that the largest pieces of copper are found associated with it. We did not observe the vein in its original repository, nor does it appear that the Indians have found it, but judging

**On Point Lake, June 25th, 1821**

amongst the loose soil, that the Indians search for copper. Amongst the specimens we picked up in these valleys, were plate of native copper; masses of pistacite containing native copper; of trap rock with associated native copper, green malachite, copper glance or variegated copper ore and iron-shot copper green; and of greenish grey prehnite in trap (the trap is felspar, deeply coloured with hornblende), with disseminated native copper; the copper, in some specimens. from the specimens just mentioned, it most probably traverses felspathose trap. We also picked up some fragments of a greenish-grey coloured rock, apparently sandstone, with disseminated variegated copper ore and copper glance; likewise rhomboidal fragments of white calcareous spar, and some rock crystals. The Indians report that they have found copper in every part of this range, which they have examined for thirty or forty miles to the N.W., and that the Esquimaux

**Bloody Falls, July 17th, 1821**


Cape Hearne
DUKE OF YORK'S ARCHIPELAGO
Pt. McKenzie
Couper's Isl.
Berens Isles
Sir G. Moore's Isles
Lawfords I.
Sir F. Hearne's Isl.
Hepburn I.
Gray's Bay
Richardsons River
Bloody Fall
Escape Rapid
Gravelly Beach
Port Epworth
Tree River
Copper Ore found here
No trees beyond this place
Trap Hills in ranges nearly parallel to the Coast
Sandstone Rapids
Musk Ox Rapid
Mouse River
Hooks Band of Indians
ESKIMAUX LAND
Arctic Circle
COPPERMINE RIVER
Fairy Lake River
White Sandy River
Rapids Canoe broke here
Banks well wooded
Trap Hills
Clay Slate
A River enters here
Lake of the Red Rock
POINT LAKE
Conge ca tha wha chaga Lake
Peacock Hills
Willinghams Mountains
Belangers Rapid
CONTWOY TO OR RUM LAKE
Cascade 40 feet perpendicular
Small streams running in various directions
Big Lake
Lake Providence
Obstruction Rapids

come hither to search for that metal. We afterwards found some ice-chisels in possession of the latter people twelve or fourteen inches long, and half an inch in diameter, formed of pure copper."

In the same year, 1821, Franklin and Richardson found trap rocks of the copper-bearing series eastward along the Arctic coast for nearly two hundred miles, or as far as the east side of Bathurst Inlet, though no copper or copper ore seems to have been found in them.

On Franklin's second journey in 1826 Richardson recognized the existence of rocks of similar character at a number of points along the Arctic coast for 200 miles west of the Coppermine river.

From the description quoted above it would appear that the rocks on the Coppermine river are similar to the copper-bearing rocks on Lake Superior, and that the conditions under which the copper occurs are also similar to them under which it occurs on Keewenaw Poin on the south shore of Lake Superior. Speaking broadly, these rocks would appear to indicate a repetition to the north of the great Archean protaxis of the conditions which have prevailed on Lake Superior to the south of it.

tained in a letter from Mr. V. Stefansson, dated Langton Bay, July 1st, 1911, and addressed to Dr. H. C. Bumpus, Director, American Museum of Natural History, New York City. Mr. Stefansson writes as follows:—

"That copper was to be found on the Coppermine river has been generally known for more than a century; we found, however, that even the Eskimos nearest the river, while they pick up some copper on the banks occasionally, depend chiefly on the richer deposits north of Dismal lake. Neither of these regions is rich in native copper, however, compared with the mountains northeast of Prince Albert Sound" (on Victoria Land).

This is the first record of the occurrence of native copper or the copper-bearing rocks on any of the large islands in the Arctic Ocean, and as Prince Albert Sound is probable accessible to ocean-going ships by way of Behring Sea, the locality might be much easier to explore and mines might be much more readily developed than in the districts on the mainland in the vicinity of the Coppermine river.

Judging from the evidence here presented, the existence of a great copper-bearing area on the Arctic coast

**Mouth of Coppper Mine River, July 20th, 1821**

Since Franklin and Richardson visited, mapped, and described this region, very little attention has been paid to it, though Thomas Simpson and John Rae both crossed the Coppermine river, and make mention of it in their journals. .

The traps and associated rocks may cover a very much larger area than we know of at present, for, in 1903 I found them on the north shore of Doobaunt lake, and on the Doobaunt river below the lake. As late of 1902 the late David Hanbury ascended Coppermine river as far as the portage to Great Bear lake in his journey from Hudson Bay to the Mackenzie river, and he has mentioned in his book that one of his men named Sandy, while tracking up the river, "was nearly tripped up by a chunk of native copper on the shore. I weigher about twelve pounds."

An important addition to our knowledge of the copper-bearing rocks of the northern coast of America has just been brought to my attention by Dr. James Douglas, of New York, and I am permitted to publish it through the kindness of the secretary of the American Museum of Natural History. The information is con-

of America near the Coppermine river is certain, and it is also reasonably certain that that area is very much more extensive than the copper-bearing area south of Lake Superior, extending, as it does, from Victoria Land and the hills west of the Coppermine river, to the shores of Bathurst Inlet far to the east, but whether native copper will be found anywhere as plentifully distributed or in such rich segregations as on Keewenaw Point, is yet quite uncertain. As the copper-bearing area in Northern Canada is larger it is quite possible that the mineral deposits may be similarly larger, and it is worth while for the Canadian people to find out whether they have in this far northern country a great reserve of copper ore for the use of themselves and the world when the mines that are now being worked shall become depleted. It may seem foolish for us to spend money at the present time to determine the existence of bodies of ore which we cannot use, but copper is one of the most useful metals in the world to-day, and it behooves a nation like an individual to study its ore reserves in order that it may deal with them wisely, and have them developed in such a way

HENDERSON TALC MINE, MADOC, ONT.
Pillar and Wall Solid Talc.—This is second of series of underground photographs of Canadian Mines.

that they will bring the greatest benefit to the people. Therefore, I say that we Canadians, knowing that we possess an area of potential wealth in copper in that far northern country, should examine it carefully and find out whether we have a natural asset there that, if intelligently used, will add greatly to the wealth of the nation, or whether we are prepared to hand over that possible asset without knowing whether it is valuable or not, to private individuals, who, by the expenditure of a little capital and energy, may make enormous fortunes as a result of our negligence.

# NEW TYPE MINE LOCOMOTIVE

The accompanying illustrations show a new type of mine locomotive which has recently been placed on the market by the Baldwin Locomotive Works and the Westinghouse Electric & Mfg. Co. The notable features are the open, cast-steel bar frame and the specially designed commutating pole mine motors shown in Figs. 2 and 3.

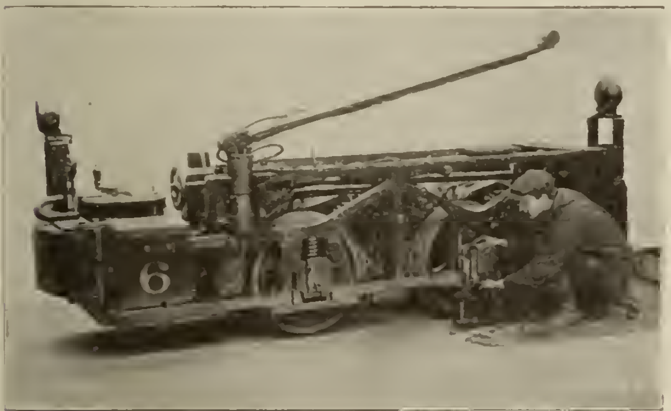


Fig. 1

This type of locomotive is distinguished for its accessibility, simplicity, durability and strength. It is claimed that it will operate satisfactorily under the worst conditions with minimum attention and maintenance expense. The frame is designed to give maximum strength and to allow ready access to all parts so that the locomotive can be inspected and overhauled, when

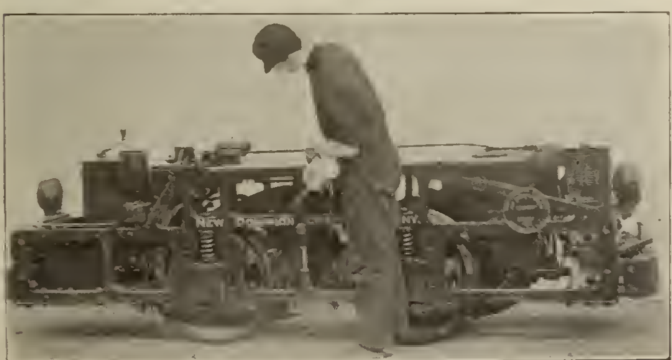


Fig. 2

necessary, in the least possible time. The construction is the same as that used on heavy Baldwin steam freight engines.

The open frame gives much better ventilation to the motors and resistance than that obtained by armour-plate frame construction. The motors, brake rigging, brake shoes and sand boxes are easily accessible. The upper parts of the motors and armature bearing housings can be removed without disturbing the suspension, so that each part of the motor is exposed for inspection. To remove the grid resistors the only work necessary is to take off the locomotive covers and loosen the bolts and terminals that hold the resistor frames in place.

An attractive feature introduced on locomotive with outside frames is the Vauclain removable gib. To remove a journal box with this gib, it is only necessary to

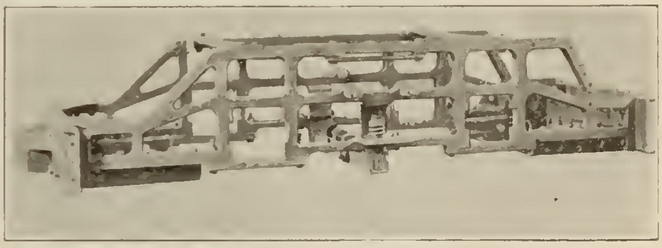


Fig. 3

drop the binder and take the weight off the journal box. The journal box may then be slipped out from the side as shown in Fig. 4. On locomotives with inside frames the journal box cellars are arranged to be easily dropped out for re-packing. If it is desired to take out a set of wheels and axle, this may be done without disturbing the motor suspension or connections by simply

Fig. 4

blocking the motors in place and removing the binders. The wheels may then be dropped.

The motors used in this locomotive have decided advantages over other types, of which their excellent commutation, due to the use of commutating poles, is of first importance, because it increases reliability of operation and cuts down the cost of maintenance. With good commutation, the commutator and brushes require very little attention and brush renewals are seldom necessary. The insultation of armature and field coils remains in good condition for a much longer time than on other types because of the absence of copper and carbon dust.

The frames of the motors are made of cast steel and are split diagonally. The axle bearings and suspension nose are on the lower half of the frame, so that the upper half, the armature, and bearing housings can be removed without disturbing the suspension or axle brackets. The armature core is mounted on a spider to which it is keyed, making it possible to remove the shaft without disturbing the windings, and also reinforcing the shaft against bending. Large openings are provided in the spider and through the core to give sufficient ventilation.

## NATIONALIZATION OF MINES

The following clipping goes to prove that Mr. Keir Hardie, M.P., can be as visionary as the best:

"London, Feb. 18.—The Miners' Federation of Great Britain has declared by a majority of 60,000 in a total vote of 232,000 in favour of a five-day working week for miners. The executive committee, however, has adopted a resolution saying that the majority is not large enough for any action to be taken and that there must, therefore be another vote.

"J. Keir Hardie, M.P., has stated that within a few months the labor party, in conjunction with the miners' federation will begin a great campaign for the nationalization of the mines. He says that a bill to accomplish this is now being drawn and will soon be presented in Parliament. According to the terms of the bill, the mines are to be paid for with government stock, a second fund being provided to redeem the stock within a given period.

"The mines would not be bought on stock exchange quotations. That would mean that they would cost at least $750,000,000, but another way of setting a price would be adopted by which the cost to the government would be reduced to not more than $375,000,000.

"If the mines were nationalized, Mr. Hardie declares, coal would be sold at a fixed price, just as postage stamps are at present, and the cost of coal to the consumer would probably not exceed one-half of what was now being paid. By the plan under consideration, the mines would not be controlled by a manager appointed by the government, but would be managed on much the same lines as the national railways in France. Every time there was a dispute a committee of workmen appointed by the workmen from their own ranks should meet to consider the dispute and the decision of that committee should be binding upon the manager as well as the workmen."

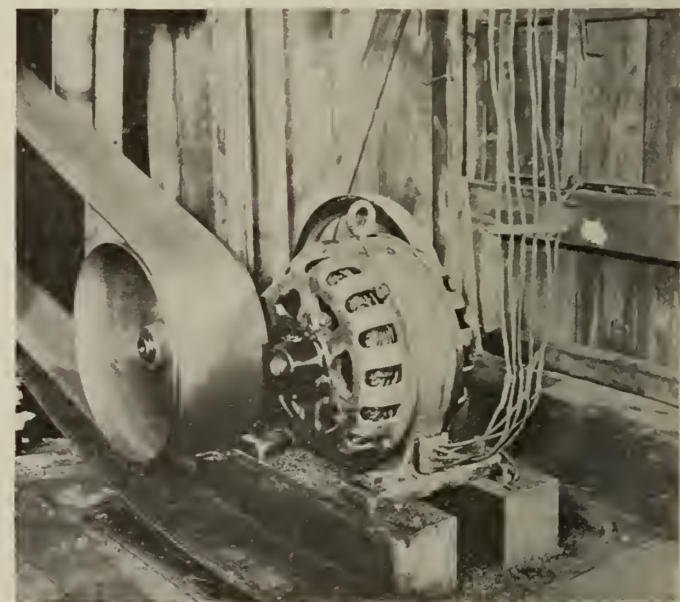
## TWO-SPEED A.C. MOTOR FOR MINE FAN DRIVE

An excellent emaple of the efficient adaptation of electricity to mine service is illustrated in the accompanying picture, which shows a two-speed, alternating current, three-phase, 60-cycle, 440-volt motor, belted to a Guibal 12-foot fan installed in the Greensburg No. 1 mine of the Keystone Coal Company, near Greensburg, Westmoreland county, Pa.

The force of miners is considerably less at night than during the daytime, and consequently it is desired to run this fan at only about one-half the speed at night that is required during the day. For this service there was selected a Westinghouse type 661 squirrel-cage type induction motor, with a rating of 7½ horse-power at 600 r.p.m., and 15 horsepower at 1,200 r.p.m.; the other characteristics being as mentioned above.

The change in speed is accomplished by changing the number of poles. The stator of the motor is provided with two windings; one of which gives 6 poles, resulting in a speed of 1,200 r.p.m., and the other gives 12 poles, with a speed of 600 r.p.m. The connections are changed for one set of winding to the other by the controller. This is a most efficient form of control for an installation of this kind, as the motor of control for an installation of this kind, as the motor can be operated at low speeds at its highest efficiency, there being no losses in the control resistance. The motor itself is particularly well adapted to this class of service on account of its rugged characteristics, which insure great reliability of service.

Current for the operation of this motor is furnished by the West Pennsylvania Electric Company. In order to determine the results obtained from the installation, tests were made by Mr. C. V. Elliott, electrical engineer of the Lighting Company, which showed the following results:



The fan is 5 feet 6 inches wide, and the depth of blades 3 feet 6 inches. When running at 120 r. p. m., with 1.5 inches water gauge, or an equivalent pressure of .87 ounces per square inch, 46,200 cubic feet of air per minute were delivered. The motor in performing this work took 9.6 k.w., giving an efficiency of 63.03 per cent. for the outfit. When running at half speed, or 60 r.p.m., with .6 inch water gauge, or .29 ounce pressure per square inch, 14,850 cubic feet per minu e were delivered, and an efficiency of 58.33 per cent. was obtained.

These results are particularly important, as they show economy in the use of purchased power, which is becoming standard practice where alternating current is available.

# NEW COAL FIELDS IN ENGLAND

The following extract from the Boston News Bureau has considerable interest:

Boston.—The Boston News Bureau some months ago gave brief notes of the discovery of coal by borings in the county of Kent, England, where for a thousand years it has been believed impossible that coal could be found.

Now the London people are in a wordy warfare as to the value of Kent coal. It is indeed difficult to eradicate the British prejudice or to convince a dweller in London that there is just as good coal to the southeast as to the north and west of London, and coal in tens of thousands of acres.

When Sir Edward Watkin, in 1891, started his Channel tunnel at the Shakespeare cliff just below Dover, coal was not in his calculation, if, indeed, in his imagination; but when the British government put an embargo upon the Channel tunnel enterprise, holding that England was an island and must so remain, Sir Sdward Watkin turned his men and machinery to boring for coal, as there were indications that the coal field on the French side of the channel might extend into England. He found the first seam of coal at a vertical depth of 1,600 feet in 1892, or 20 years ago.

This was the nucleus of "Kent Collieries, Ltd.," which has met with indifferent success, but has spent more than a million dollars in wrestling with engineering and water problems at depth, but is now, it is believed, nearing the base of commercial production. In 1904, however, systematic boring of the country north and east of the railroad line from Canterbury to Dover was begun under the auspices of Kent Coal Concession, Ltd., and in 1906 the first payable seam was found at the Walde shaft boring six miles northwest of Dover. Now the whole country has been thoroughly explored and 13 bore holes have proven at a depth of between 1,000 and 3,500 feet coal seams aggregating about 30 feet vertical thickness throughout and extending over an area of about 100 square miles. It is said that this coal can be transported to London two shillings cheaper per ton than any other coal by reason of its proximity to the metropolis, and the quality of coal is declared as good as the South Wales steam coal and better than any other variety in England.

It is estimated that there are 10,000 million tons of coal within this area. The Snowdown and Tilmanstone collieries have at last after a great deal of trouble penetrated into the coal measures. Railways are being constructed and shipments should be into London next year.

Not less significant than the Kent discoveries is the development of the eastern extension of the Midlands coal field in the southeast of Yorkshire and the counties of Nottinghamshire and Lincolnshire. What are without doubt the finest collieries in Great Britain are to-day in the district immediately adjoining Doncaster, in a countryside that for centuries has been purely pastoral. The sum of £250,000 is said to be a usual outlay on the capital expenditure of a colliery in that district. The population has increased beyond the housing capacity, and this once peaceful countryside has experienced the growing pains of a "boom" resembling more the growth of a Canadian prairie town than anything else.

The discovery of the Kent coal seams was the indirect result of a thwarted endeavour in another direction, but the discovery of the extension of the Midlands coalfield was the result of a process of careful industive geological reasoning, chiefly to be credited to Professor Lapworth, who from indications noticed by him near Selby, Yorkshire, came to believe that the Permian formation of East Yorkshire and North Lincolnshire was laid unconformably on an anticline of the Carboniferous rocks. Actual researches proved that his belief was correct, and instead of the valuable seams of the Midlands coalfield being buried under inaccessible depths of Permian formation they were found to exist at depths quite possible for modern methods of coal extraction.

The importance of these two new coal fields to England and the Empire at large can hardly be overestimated, and it is possible that even Englishmen themselves have scarcely taken in the full significance of the new coal fields to the future of their country.

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The Standard Underground Cable Co., of Canada, Limited, has established new branch offices at Montreal, Quebec, and Winnipeg, Manitoba, in order to facilitate the prompt handling of their growing business. The Montreal office will handle all business from the province of Qubec and the eastern part of the province of Ontario. The Winnipeg office will handle all business coming from the provinces of Alberta, Saskatchewan, Manitoba and a portion of the province of Ontario lying west of Fort William. The general offices of the company at Hamilton, Ont., will handle all business from the central and northern portions of the province of Ontario. Business originating in the province of British Columbia, Alaska, and Yukon territories will be handled by the Seattle, Wash., office of the company, and business from the Maritime Provinces will be handled by the Boston, Mass. office. This is a temporary arrangement in order to secure prompt service immediately for customers in those districts until the volume of business justifies the establishing of separate offices in the Dominion.

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# ALLOYS OF COBALT WITH CHROMIUM.

A recent paper contributed to the Transaction of the American Institute of Mining Engineers, by Mr. Elwood Haynes, describes the methods employed in and the results obtained from alloying cobalt with chromium. By the addition of tungsten the hardness of alloy increases. Thus with 10 per cent. tungsten, the metal while still forging readily, is suitable for making both cold chisels and wood working tools. With 20 per cent. tungsten the alloy is decidedly harder, and will make good lathe tools for cutting steel and other metals at moderate speed. With from 25 to 40 per cent. tungsten a very hard alloy results, the tools made from which are very strong and retain their hardness at speeds which almost instantly destroy the cutting edge of a steel tool. When the tungsten reaches 40 per cent. or more, the alloy becomes so hard that it will not only scratch glass, but will readily scratch quartz crystal. Again when molybdenum is added to a 15 per cent. cobalt-chromium alloy, the latter hardens rapidly as the molybdenum content is increased. With 40 per cent. mlybdenuin the alloy becomes exceedingly hard and brittle, cuts keenly and deeply into glass, and scratches quartz crystal with ease. Generally the color and lustre of these alloys, after polishing, are brilliant, and it is stated that they seem to resist atmospheric influences equally well as the binary alloy of cobalt and chromium.

# PERSONAL AND GENERAL

Mr. Frank M. Perry has left for Cobalt to supervise development work in several Gillies Limit claims. Mr. Perry will return in time to attend the annual meeting of the Institute at Ottawa.

Mr. J. S. Fraser, of Nova Scotia, who has been superintendent of the Neville Island and Allegheny plants of the Carnegie Steel Company, has been transferred to the Clairton Steel Works, where he will be in charge of the blast furnaces.

Mr. G. S. Scott is in England on mining business. His address until early March is Copse Close, Coombe Lane, Wimbledon, London, S.W.

Dr. Alfred E. Barlow, of Montreal, attended the annual meeting of the American Institute of Mining Engineers, in New York, on February 18, 19 and 20, as the guest of the New York section.

The secretary of the Canadian Mining Institute has been informed that Mr. W. Fleet Robertson, Provincial Mineralogist of British Columbia, intends to be present at the annual meeting of the Institute in Ottawa next week. Mr. M. E. Purcell, superintendent of the Consolidated M. & S. Company's Rossland mines, and chairman of the Western Branch of the Institute will also attend upon the invitation of the Council.

Mr. John Hopp, of Barkerville, B.C., is at present in Montreal, and will remain in the East until the end of the first week of March.

Mr. J. Oblaski has been re-elected President of the Chambre de Commerce Francaise of Montreal.

The three year contract of Mr. A. B. W. Hodges as general manager of the Cerro de Pasco Mining Company, terminated on February 28th of this year. Mr. Hodges leaves at once for Canada and the United States. He will visit British Columbia during July or August.

Mr. J. O'Brien has brought suit in Montreal against the Union Abitibi Mining Company. The plaintiff's claim is based upon injury done to certain timber limits in the Pontiac district, Quebec. The defence claims that as the timber was used for local purposes and not marketed, there was nothing illegal in cutting it.

Mr. M. K. Rodgers, of Seattle, Washington, well known in British Columbia in connection with the development to important mines of the Nickel Plate group, in Similikameen district, and the Hidden Creek group, near Observatory inlet, is in Mexico. The former mines, now owned by the Hedley Gold Mining Co., paid in 1912 dividends totalling 30 per cent. on the company's issued capital of $1200,000 (amount of dividends $360,000) as compared with 25 per cent. in 1911. The Granby Co. owns the Hidden Creek group, and rerecently its directors authorized the expenditure of about $2,000,000 in further underground development, and provision of smelting, hydro-electric power, transportation, and shipping dock facilities, together with buildings for mechanical purposes and accommodation of the company's officials and workmen.

Mr. W. L. Bell, superintendent of the British Columbia Copper Co.'s smelting works at Greenwood, Boundary district, B.C., recently spent a few days in Spokane, Washington.

Mr. Henry Clark has been requested to address the Western Branch of the Canadian Mining Institute on the subject of "Modern Surface Equipment of Coal Mines," and in connection therewith to show lantern-slides and models he has, to illustrate this subject. It is planned to have the benefit of Mr. Clark's address at a meeting of the branch to be held in Nanaimo, Vancouver island, early in March.

Mr. E. E. Campbell (B.Sc. McGill, 1908), of the Granby Consolidated Mining, Smelting and Power Co.'s engineering staff, was a passenger on the steamer "Cheslakee" when that vessel filled with water and sank at the wharf, Van Anda, Texada island, B.C., but fortunately he was one of those who got ashore without injury. When the steamer took such a strong list that water began to pour into her, she was headed for the dock, which she reached in time for most of those on her to get ashore, but several others were drowned.

The Mines Branch of the Canada Department of Mines has published as an advance chapter of the "Annual Report on the Mineral Production of Canada During the Calendar Year 1911," a pamphlet on "The Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals" in that year, prepared by Mr. Cosmo T. Cartwright, Assistant Mining Engineer, Division of Mineral Resources and Statistics.

Mr. Wm. B. Bornberg, of Spokane, Washington, manager for the Treasure Mountain SilverLead Co., which, during the past year has been opening a new mining property, situated about 20 miles about Otter flat, Tulameen district of British Columbia, has been in Victoria, interviewing the Provincial Government with the object of getting a wagon road constructed so as to make the new camp more accessible than it is with only a trail to it for about 18 miles beyond the end of the nearest wagon road.

Mr. W. J. Elmendorf, of Victoria, B.C., general manager for the Portland Canal Tunnels, Limited, is supervising the work of driving a 2,000-ft. cross-cut adit undertaken by the company on his recommendation, with the object of proving whether the veins of ore opened at comparatively shallow depths on several claims, continue down to the depth to be explored by this low-level tunnel.

Before leaving the British Columbia Copper Co.'s Mother Lode mine, near Greenwood, B.C., for Sudbury, Mr. E. Hibbert was presented with a gold watch and chain, valued at $210, by the employees who had worked under him at that mine. Mr. F. S. Norcross, who had been superintendent at the Rawhide mine, Phoenix camp, also in Boundary district, has been appointed to succeed Mr. Hibbert as superintendent of mines, and Mr. James J. Johns, for years foreman at the Mother Lode, has been promoted to the position of superintendent of that mine.

Mr. A. B. W. Hodges, of Lima, Peru, general manager for the Cerro de Pasco Mining Co., is stated by the Grand Forks Gazette to be expected to shortly visit Spokane and Grand Forks. Mr. Hodges was for some years manager in British Columbia for the Granby Consolidated M. S. and P. Co. and made Grand Forks his headquarters.

Mr. John Hopp, who is the largest hydraulic placer-gold mining operator in Cariboo mining division, British Columbia, recently left that province on a visit to

Philadelphia and New York. It is probable he will also visit the larger cities of Eastern Canada before returning to the West.

Mr. Andrew G. Larson, of Vancouver, B.C., has been spending a winter vacation in Los Angeles, Southern California. From that city he sent a "good-luck" telegram to the Old-Timers' Association while that organization was holding a reunion in Rossland recently.

Mr. E. G. Montgomery (B.Sc., McGill, 1908), is assistant superintendent at the Consolidated Mining and Smelting Company of Canada's Star-War Eagle group of gold-copper mines in Rossland camp, British Columbia.

Mr. J. L. Parker has been spending the winter on his Lee Lake ranch, near Burmis, southwest Alberta.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Mining and Smelting Company of Canada's Centre Star-War Eagle group of mines, and who is chairman, for the current year, of the Western Branch of the Canadian Mining Institute, will be the guest of the Institute at the forthcoming annual general meeting, to be held in Ottawa. Mr. Purcell is an active member of the branch, with which he has been associated from the time of its inception five years ago.

Prof. Milnor Roberts, of Seattle, Washington, U.S.A., dean of the College of Mining of the University of Washington, is endeavouring to arrange for his senior mining engineering class to spend part of the spring vacation in Boundary district, British Columbia, where the big copper mines and smelteries would afford them much instructive information. It is planned to also visit Republic gold camp and Chewelah copper camp, both situated in the interior of the State of Washington.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, has arranged to attend the meeting of the International Geological Congress organization committee, to be held in Ottawa on March 4, and afterward the annual general meeting of the Canadian Mining Institute. Mr. Robertson is a McGill graduate (B.A.Sc., 1880), a past councillor of the Institute, and an ex-chairman of the Western Branch of the Institute.

Mr. Robert C. Sticht, now general manager of the Mt. Lyell Mining and Railway Co., who recently removed his headquarters from Queenstown, Tasmania, to Melbourne, Australia, was formerly well known in North America as a metallurgist.

Mr. G. Stilwell, superintendent for the Silverton Miles, Ltd., of the Hewitt-Lorna Doone group of mines, British Columbia, has spent a number of years opening that mining property, on which a large amount of underground development has been done under his direction. The ore contains silver, lead, and zinc; some of the finest specimens of ruby silver seen in Slocan district have been found in these mines, which will soon have the added distinction of being the first in Kootenay district, in connection with which the Minerals Separation flotation process is in use. Mr. M. S. Davys, managing director of Silverton Mines, Ltd., who resides at New Denver, Slocan lake, is keeping in close touch with the erection and equipment of a new concentrating mill for the company, which is being put in under the direct supervision of Mr. C. Hanckel, formerly with the Zinc Corporation, Limited, at Broken Hill, New South Wales.

Mr. Thos. R. Stockett, of Nanaimo, Vancouver island, B.C., general manager for the Western Fuel Company, with operating coal mines at or near Nanaimo, known, respectively, as No. 1 Shaft, Protection Island, and Brechin mines, continues to take much interest in provision for the protection of the miners. His company was the first in British Columbia to obtain for its own use oxygen-breathing apparatus, and, too, the first to erect and equip a mine-rescue training station. In these matters Mr. Stockett has all along had the active co-operation of his superintendents, first of Mr. Thos. Graham, now chief inspector of mines for British Columbia, and then of Mr. Thos. McGuckie, the present general superintendent. There are now in the company's employ 65 men who have taken the full mine-rescue training course and obtained certificates of competency in that work. An evening session of the meeting of the Western Branch of the Canadian Mining Institute, to be held in Nanaimo shortly, is to be occupied, first, in hearing addresses on mine-rescue matters, and afterward in holding a "smoker" which will be largely attended by the company's mine-rescue "graduates" and their fellow miners.

Mr. Wm. Thomlinson, of New Denver, B.C., who some time since contributed a paper on "Notes on Minerals Found in Slocan District, B.C." (as Canadian Mining Journal for November 15, 1911, p. 737) recently prepared an interesting article on "Names of Minerals."

The University of Washington, Seattle; State College of Washington, Pullman; and University of Idaho, Moscow, Idaho, have been giving short mining courses which have been well attended by miners, some of them for the second year.

Mr. George E. Wearing, formerly engaged in mining at Nome and other outlying parts of Alaska, has for about a year been directing the sinking of two shafts at Morden, near South Wellington, Vancouver island, where the Pacific Coast Coal Mines, Limited, is opening a new coal mine. During the first half of February coal was encountered in the mine shaft, at a depth of 610 ft. A station is being cut so that the mining of coal may soon be commenced. There is stated to occur here a fine bed of good coal, and the shaft is alongside the railway to the company's docks.

Mr. A. B. W. Hodges' contract to remain for three years with the Cerro de Pasco Mining Co., of Lima, Peru, as general manager, expired in February. Mr. Hodges writes that for the next few months he proposes to travel in the United States and Canada, but his permanent address will be P.O. Box 140, Toolele, Utah.

Mr. C. N. Henrotin has resigned the post of superintendent of mines to the Canadian Copper Co. at Copper Cliff, Ont.

At the last meeting of the Council of the Canadian Mining Institute, the following gentlemen were admitted to membership: (Members)—Messrs. John A. Allan, Edmonton South, Alta.; Norman M. Campbell, Montreal, Que.; John R. Cox, Ottawa, Ont.; H. S. Dunn, Jr., Scotland; A. E. Geister, Buckingham, Que.; Thos. C. Gorman, Ottawa, Ont.; A. O. Hayes, Princeton, N.J., U.S.A.; C. B. Kingston, London, E.C., England; Robt. J. Lee, Elcan, Alta.; T. A. MacLean, Ottawa, Ont.; W. W. Mein, New York, U.S.A.; N. C. Pitcher, Lethbridge, Alta.; Chas. F. Rand, New York, U.S.A.; J. A. T. Robertson, Szechwan, China; C. M. Ross, Ottawa; R. S. G. Stokes, New York, U.S.A.; Robt. C. Wallace, Winnipeg, Man. (Associates)—Col. John Carson, Montreal, Que.; The Hon. P. Poirier, Ottawa, Ont.; Paul Rochussen, Vancouver, B.C.

# SPECIAL CORRESPONDENCE

## NOVA SCOTIA

### Dominion Coal Company Outputs.

The corrected outputs in January from the Glace Bay mines of the Dominion Company showed a total of 384,361 tons, comparing with 281,007 tons in January, 1912. The Springhill outputs were slightly smaller than last year, being 30,424 tons against 39,084 tons in January last. The February outputs will approach 360,000 tons at Glace Bay, and 32,000 tons at Springhill, comparing with 330,326 tons and 34,708 tons respectively in February, 1912. The combined outputs for the first two months of the year will be 807,000 tons compared with 685,000 tons in 1912, giving a net gain of over 120,000 tons. The weather conditions have been unusually favourable for colliery operations, but at sea heavy weather has been the rule for nearly three months.

### Barometric Records at Collieries.

The fluctuations of the barometer during the months of December and January were unusually noticeable. The summer of 1912 was accompanied by a persistently low and steady barometer, and there was a marked absence in Nova Scotia of heavy wind and rain storms. Although the summer was cold and apparently wet, the actual rainfall was much below the average, as was evidenced by a pronounced shortage of water. Towards the end of November, however, and in December there were heavy rainstorms accompanied by gales and irregularities of the barometer. On the 27th of December the glass in Cape Breton fell from 30.5 inches to 28.5 inches, apparently the lowest reading in Nova Scotia for many years past. The suddenness of the fall and the low reading reached had a noticeable effect on the ventilation of some of the collieries. The Mines Regulation Act requires that a barometer shall be placed in a prominent position at every coal mine, and records of the reading of the barometer are required to be kept at every colliery by some responsible official. It is difficult, however, to see the real utility of this provision. The mine gases are, of course, a much more delicate index to barometric variations than the most accurate barometer, and the effect of a marked change in the atmospheric pressure is felt in the mine long before it can be noticed on the ordinary barometer. The effect of a change in the atmospheric pressure as felt underground is concerned more with the rapidity of the rise or fall of the barometric index, than with the actual pressure itself. There may possibly be some utility in studying barometer readings if it is possible to forecast a rise or fall, but it is not possible to form any true idea of barometric action from a series of detached readings recorded at some set hour of every day. To study the barometer intelligently there must be a continuous reading, over very extended periods, showing the conditions obtaining before and after every marked variation. For this reason, it is doubtful if any form of barometer outside of a recording instrument, or "barograph" is of any real usefulness at a colliery. The so-called "colliery warnings" issued for many years in the English newspapers are a classic joke amongst mining engineers on the other side. In Canada, however, and the United States, where the continental conditions permit of barometric observations over a large land area, it is possible to form very accurate ideas regarding the tendency of the barometer and the direction of travel of certain barometric zones. This being so, it is conceivable that a colliery manager could so use the telegraphic observations as to anticipate important barometric disturbances and take whatever precautions suggested themselves to him. In Germany telegraphic "warnings" are sent to colliery managers of approaching fluctuations of the barometer, and from the School of Mines at Bochum a warning is also sent out whenever the variation of the magnetic needle is greater than usual.

### Dominion Coal Company Employees Benefit Society.

The report of this Society for the year ending 31st December, 1912, shows that the membership increased from 10,045 members at the end of 1911 to 11.120 at the end of 1912.

The receipts for the year amounted to $144,364, of which $63.485 was received from members, $63,197 from the Dominion Coal Company, $11,455 from the Government of Nova Scotia, and $6,245 from interest on investments.

The expenditure amounted to $98,629, leaving a surplus of $45,735. During the year liabilities were undertaken to the amount of $48,585, and there was paid on account of accrued liabilities the sum of $24,353.

The number of deaths was 70, placing on the funds 40 widows and 89 children. On 31st December, 1911, there were 54 widows and 238 children on the fund, and at the end of 1912 there were 87 widows and 293 children, an increase during the year of 33 widows and 55 children.

The payment of $98.629 included $68.910 paid in weekly indemnity to members disabled either by accident or sickness, $7,629 on account of death claims and $16,723 paid to widows and children of deceased members.

The gross assets of the Society amounted to $183,001. The sum of $125.000 is set aside as a reserve to meet liabilities incurred. The net surplus at the end of 1912 is shown as $50.501.

At the end of 1912 the Society had completed two and one-half years of its life, and shows very satisfactory progress in so short a space. The membership includes practically all the company's employees in Cape Breton, and has grown from a little under 7.000 in 1910 to the present figure. A further increase in the membership may be forecasted for 1913. An encouraging feature is the growing income from investments, which now more than pays the expenses of administration. As the payment to widows extends over five years, and the payment to children up to the age of fourteen years, the Society has not yet experienced its maximum liabilities.

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## ONTARIO

### LARDER LAKE.

Goldfields, Limited, of Larder Lake, announces its intention of adding another thirty stamps to its mill, which according to computation will raise its capacity to 500 tons per day. At present there are thirty stamps dropping, but as the mill is of the simplest description the duty per stamp will probably not be very high. Goldfields, Limited, was formed to take over the Harris Maxwell, The Proprietary, and the Tourneninie (Old Indian) properties. The company secured control of these two latter properties after they had gone into liquidation, but only the Harris Maxwell is now being worked. The outcrop of the ore body has been stripped on a rise about 100 feet above Larder Lake, the mill and the rest of the plant being at the foot of the hill and the ore body cut at a depth of 65 feet. The ore body as it is at present defined is about 115 feet long by about 15 feet wide, and raises are being made through to the surface in several places. The company has a power plant at Raven Falls where there can, if necessary, be generated 15,000 horse power. Everything in the mine is electrically driven including the twelve-drill compressor.

### PORCUPINE.

The developments on the McEnaney in Porcupine have been so remarkable that it has been determined to erect a twenty stamp mill with cyanide plant as soon as any addition is made to the five-stamp mill already in operation. The five stamps are at present dropping on forty tons of ore per day. Ore is being taken from the drift on the vein at the second, third and fourth level. It is the progress being made at the fourth level that has surprised the management. When the vein was first cut there was a sixth foot width of $48 ore. That is the biggest ore body and the highest grade yet found in the mine where every level opened has proven better than the one above. This level has been developed for about 30 feet and in the face now there is eight feet of ore running between $30 and $40 with a continuous ore body from the cross-cut. The growth of the McEnaney from a poor prospect to a remarkable mine in one year has been the feature in Porcupine within the last six months.

### KIRKLAND LAKE.

From the Tough claims at Kirkland Lake on an open cut 35 feet long there has now been taken 52 tons of ore which will average over $500 to the ton. No considerable depth has been attained yet and the deposits may be very shallow, but it has been demonstrated that the ore in sight can be taken out with good profit and that the insignificant veins on the surface may develop into fair ore bodies below. The most encouraging feature of this remarkable property is that each successive shipment from the property has been richer than the preceding one.

There is now being collected at Swastika a thirty ton shipment of ore which will exceed any consignment of crude gold ore that has left the north country.

### GOWGANDA.

The Mann at Gowganda has pushed its drift over the boundary into what was once Boyd Gordon territory and has taken out enough ore to pay back in full the entire price paid for the property.

The Boyd Gordon had a rather spectacular silver showing on the surface and was sold by Al Boyd and his associates for a long price. The purchasing company went to work at a tremendous expense, but it appeared to be merely silver plated as values soon disappeared as the shaft was sunk.

Then the Mann, owning the adjoining properties opened up the claim and began to develop. So encouraged were the Mann owners with what they found that they approached the Boyd Gordon Company for the purchase of the latter property. The directorate of the Boyd-Gordon had given up real hope and were glad to get anything that looked like real cash and the deal was closed for a sum said to have been in the neighborhood of $8,000. The Mann developed the vein right up to the Boyd-Gordon property and followed it over the line. Already the Mann has yielded enough ore to cover the purchase of the property.

### COBALT.

The Cobalt Lake fault the Right of Way is now developing to discover what prospects it has of getting ore along the contact. Although, of course, it is not known where it will be struck the management expects to strike it 350 feet below the surface or 200 feet below the level they are working at present. The new ore body which was recently found at the first level has been drifted on as far as the La Rose boundary where it was strong and of high grade ore. In all the Right of Way had about 32 feet of it. The vein for that distance averaged two and a half inches of ore that ran between 1500 and 2000 ounces. The vein has not been picked up on the second level yet, but a shaft has been put down.

After five years of litigation the law suit between the Bailey Cobalt Mining Co. and the Cobalt Central Mining Co. has been settled. $31,000 was the amount awarded the Bailey Cobalt and the long legal fight is over. The action was first brought by the Bailey Cobalt Mining Co. against the old Cobalt Central, but that organization went into liquidation and the liquidators have been waging the fight ever since.

The case dates back to 1907 when the old Cobalt Central was the most advertised producer in the camp and had a higher place on the stocks of the New York Curb than Nipissing. The management of the Cobalt Central discovered that a goodly part of the ore body was close to the Bailey line and made overtures to that company to mine the ore on a royalty basis. The Cobalt Central was to pay all expenses and deduct the same from the gross receipts, the two companies to share equally in the proceeds.

When the time for the Central to make a settlement came a dispute was raised as to the exact location of the line between the two properties the Central claiming a plot of territory and the Bailey disputing.

## BRITISH COLUMBIA

The pamphlet, "Preliminary Review and Estimate of Mineral Production, 1912," issued in January by the Provincial Department of Mines, has been in such demand that it has been found necessary to have one thousand more copies printed, the larger supply at first provided having been exhausted.

**Dividends from Metal Mining.**—The year 1913 has witnessed an encouraging beginning in dividend payments by mining companies operating metalliferous mines in the province. The Standard Silver-Lead Mining Co. paid dividend No. 10 on January 10, and No. 11 on February 10, each of $50,000, being two and a half per cent. a month, or at the rate of 30 per cent. per annum. The company made its first distribution of profits in April, 1912, of $25,000, and has since divided $50,000 each month, so that the distribution as at February 10 brought the total of dividends to that date up to $525,000 on an issued capital of $2,000,000. On January 15, the British Columbia Copper Co. distributed $88,756.35, being at the rate of 15 cents a share on its 591,709 issued shares. The Granby Consolidated Mining, Smelting & Power Co. has declared a dividend of $1.50 a share, payable March 1; as at the date of its last annual report the company's total of issued shares was 149,985, this involves a distribution of $224,977.50. The total of dividends to March 1, inclusive, will, therefore, be $413,733.85. On February 8, the Engineering and Mining Journal, New York, included in its list of January dividends, Le Roi No. 2, Ltd., 36 cents a share, total $43,740, but pending confirmation from Mondon, this is not included in the aggregate of dividends to March 1, above given.

**A Complicated Case.**—The Vancouver Daily Province published on February 15 the following: "One of the most complicated cases before the courts for some time was opened yesterday before Chief Justice Hunter, in which the British Columbia Copper Co. is suing E. M. McKittrick, of Indiana, and H. C. Kerman (sheriff), J. S. Birnie (registrar of court at Greenwood), and C. J. Leggatt, a solicitor.

The suit arises out of the death of G. C. McKittrick at one of the mines of the company in Boundary district, on May 28, 1910. The Miners' Union put in a claim for compensation on behalf of McKittrick's father, who resides in Indiana. The claim was referred to the county judge at Greenwood to arbitrate. The Ocean Accident and Guarantee Co., which insured the British Columbia Copper Co., after negotiations with Mr. Kittrick, Sr., in Indiana, obtained from him, for a sum of $250, a release of his claim. After obtaining this release, they notified Mr. Leggatt, who was prosecuting the claim for compensation on behalf of McKittrick at the instance of the Miners' Union. Mr. Leggatt ignored the settlement and succeded in getting an award of $1,500 from the arbitrator and proceeded in due time to take out an execution against the British Columbia Copper Co. for the amount of the award, though warned by the company's solicitors that they would hold him liable for damages. Under the execution, Mr. Leggatt and his co-defendants garnisheed monies due to the British Columbia Copper Co.

The suit before the court now is for an injunction to restrain the defendants from exercising the execution, a declaration that the award of the arbitrator be set aside, a claim for $2,000 damages for the loss of interest on the monies tied up by defendants on the garnishee proceeding and general damages.

The principal defence is that the plaintiffs did not attend the arbitration and produce evidence to show that any settlement with McKittrick had been arranged. The outcome of the case is being looked forward to with much interest by miners of the interior of the province.

**East Kootenay.**—The Consolidated Mining and Smelting Co. during January shipped about 3,600 tons of lead-ore from the Sullivan Group mine to its smelting works at Trail. Much exploratory work having been done in new ground last year, an enlarged production of ore is looked for in 1913. Operations at the company's St. Eugene mine are now on a much smaller scale than in past years, but there is still a small production of ore being maintained.

At the several collieries in Southeast Kootenay, coal-mining is generally active, although occasionally the output is unfavourably affected by a shortage of railway cars. One colliery—that of the Corbin Coal and Coke Co., of Spokane, Washington—with coal mines situated about 14 miles south of McKillivray, a station on the Canadian Pacific Railway Co.'s Crow's Nest Railway, is preparing to mine coal open-cast, having cleared off the surface debris from a considerable area so as to allow of the big deposit of coal, occurring almost at the surface and proved to be fully 300 ft. wide, being worked as an open quarry. It is proposed to use a steam-shovel to take the coal direct from the face and load it into railway cars.

**West Kootenay.**—Deep snow has interferred somewhat with mining operations in Ainsworth and Slocan divisions, though mines situated near one or other of the lakes have not had similar transportation difficulties to those experienced by mines in the midst of the mountains. The Bluebell, near Kootenay lake, and the Standard and Van Roi, near Slocan lake, have kept up their respective outputs with little or no diminution. The Rambler-Cariboo and Ruth-Hope have also made shipments, though on a smaller scale. It is expected that the former of these two will this year produce much more ore than in earlier years, for it now has much improved transportations facilities, an aerial tramway having been constructed from the mine down to the concentrating mill recently completed alongside a newly-finished branch railway line. Near Sandon, deep-level development is being continued at the Slocan Star and Payne mines, but snow slides and accompanying winter difficulties have made it necessary to suspend work for the time at several mines in the vicinity of Cody. The Lucky Jim mine, situated on the divide between Slocan and Ainsworth divisions, and the Retallack & Co. and Utica mines, on the Ainsworth side of the divide, are among the operative mines of this part of West Kootenay district.

In Nelson division, the British Columbia Copper Co. is continuing development of the Eureka copper mine, under option of purchase, and is shipping copper ore from the Queen Victoria mine, purchased last November, to its smelting works at Greenwood. The Kootenay Gold Mines, Ltd., is endeavouring to obtain additional capital for the purpose of doing needed development work, so as to keep its 20-stamp mill regularly running. The Consolidated Mining and Smelting Co.'s Molly Gibson silver-lead mine is also one of the ore shippers of this division. In Ymir camp, development work is being continued at the Wilcox and Dundee mines. Near Salmo, the Emerald and H. B. are shipping lead-ore. Gold ore is being crushed at the respective stamp mills of the Mother Lode and Queen, in Sheep Creek camp, and of the Second Relief, in Erie camp, while the Arlington, also at Erie, is being worked under lease.

Rossland mines made a production of about 23,000 tons in January, of which 13,000 tons was from the Consolidated Co.'s Centre Star-War Eagle group, 7,000 tons from its Le Roi mine, and 3,000 tons from the mines of the Le Roi No. 2, Ltd.

**Boundary and Similkameen.**—The big copper mines of Boundary district are maintaining their normal output of ore. The largest producers were the mines at Phoenix of the Granby Consolidated Co., the British Columbia Copper Co.'s Mother Lode coming next, and the New Dominion Copper Co.'s Rawhide mine being third, while several small mines also added to the total production for January. The British Columbia Copper Co.'s new general manager, Mr. Oscar Lachmund, has been in local charge for several weeks. No information is yet available concerning the company's future operations in Similkameen district, but it is known that the Hedley Gold Mining Co., operating in Hedley camp, continues to crush about 6,000 tons of gold ore a month and to make good profits.

**Coast District.**—The Britannia, near Vancouver city, and the Granby Co.'s Hidden Creek mines, in the vicinity of Observatory inlet, are doing the chief development work in connection with metalliferous mining on the British Columbia coast. The Marble Bay mine, on Texada island, in which bornite ore has been mined down to a depth of 1,000 feet, is now being opened at about 1,100 feet vertical depth.

Important developments are taking place on several coal-mining properties on Vancouver island. The Western Fuel Co., of San Francisco, has already spent $500,000 in connection with the opening, equipment, and transportation facilities of a new mine within five miles of Nanaimo. The Pacific Coast Coal Mines, Ltd., has lately reached coal in a new shaft, at 610 feet from the surface. The Canadian Collieries (Dunsmuir), Limited, is also opening a new mines, this being in Comox district, farther north on Vancouver island than the other properties previously mentioned.

Altogether, the outlook for mining in the Coast district of British Columbia is promising, and a larger all round production in 1913 is expected.

# COMPANY NOTES

### CALMET AND HECLA.

A quarterly dividend of $10 a share was declared by the Calumet and Hecla Mining Company on February 20th.

### THE ENGLISH COBALT LAKE COMPANY.

Under the title of the Cobalt Lake Silver Mining Company, Ltd., a company was registered on January 21st with a capital of £300,000, in £1 shares, to carry on the business of silver and general miners, prospectors, explorers, metallurgists, etc., and to acquire and deal with any mines, mining rights and metalliferous lands in Canada or elsewhere. The signatories are: J. E. Way, 36 Waveney Avenue, Peckham Rye, S.E.; C. H. Perry, 62 Ainslie Wood Road, Chingford; J. H. Jones, 212 Totterdown Street, Tooting, S.W.; H. H. Piddington, 10 Heron Road, Herne Hill, S.E.; H. C. Allaway, 15 Blucher Road, Camberwell, S.E.; A. T. C. Warbey, 57a High Street, Kingsland, N.E.; W. T. Bond, 6-21 Cranworth Gardens, Brixton, S.W. (one share each).

Minimum cash subscription, seven shares. The first directors (to number not less than three nor more than seven) are to be appointed by the signatories. Qualification £200. Remuneration, £100 each per annum (Vice-Chairman, £150). Registered office, Balfour House, Finsbury Pavement, E.C.—Exchange.

### SENECA-SUPERIOR FIRST ANNUAL MEETING.

The first annual meeting of the Seneca-Superior Silver Mines, Limited. was held in Toronto on February 15th. Total production since the early part of October of just under $200,000 worth of silver and net profits of $121,618 are shown in the annual report. Out of these profits a ten per cent. dividend was paid of $47,683, leaving a surplus on January 31st of $73,980.

Mr. R. H. Lyman, mine manager, in his report, stated that the Worth vein, which was discovered early in October, has been developed for 213 feet, and has shown an average value of 3,500 ounces to the ton for this distance. The cross-cut has been continued to 174 feet beyond this vein. and will be continued to the southeast shore of Cart Lake.

Mr. W. E. Segsworth, consulting engineer, said that it was hoped this cross-cut would disclose other producing veins. During development an area of 2,500 square feet on the vein has been broken, and the ore produced is estimated to contain about 310,000 ounces of silver. Mr. Segsworth estimates that this development has put in reserve about 1.150,000 ounces of silver.

The following directors were elected for next year: Messrs. F. H. Worth President), A. H. Dewey, F. W. Zoller, W. E. Segsworth, and R. F. Segsworth.

### HOLLINGER DIVIDENDS.

The dividends of the Hollinger mine. with the declaration to be paid February 18th, will reach nearly a half million dollars and that mine, with its four weekly basis, is as yet the only property to establish a regular dividend payment. The dividend payable this month will disburse $90,000, like the previous ones. It makes a total of 15 per cent. and $450,000 paid.

The payments to date follow:

| | P.C. | Amount. |
|---|---|---|
| 1912—November 2 ........ | 3 | $90,000 |
| November 30 ........ | 3 | 90,000 |
| December 30 ........ | 3 | 90,000 |
| 1913—January 28 ......... | 3 | 90,000 |
| February 3 ......... | 3 | 90,000 |
| Totals ..................... | 15 | $450,000 |

### CROWN RESERVE MINING COMPANY.

Notice is given that a dividend of 2 per cent. for the month of February, 1913, and bonus of 3 per cent., for the same period, making a total payment of 5 per cent., has been declared and will be payable on the 15th March, 1913, to shareholders of record the 28th February.

### COBALT LAKE MINING COMPANY.

The annual general meeting of the Cobalt Lake Mining Company was held in Toronto on February 26th.

### COBALT TOWNSITE CABLE.

Estimated results for week ended 25th January: "Value of production, £4,773; operating expenses, £1,738; weekly profit, £3,035."

### DOMINION MINISTER OF MINES.

At the annual convention of the Conservative Association of British Columbia, held at Revelstoke, B.C., a few weeks ago, and largely attended by delegates from many widely-separated parts of the province, among the resolutions presented for endorsement by the convention was one favouring the appointment of a Dominion Minister of Mines. The resolution was presented by delegates from Nelson, B.C., but in committee was altered at the persistent request of Mr. E. Jacobs, so that as presented to the convention and adopted it read as follows:

"That, whereas the mining industry has become one of the most important in the Dominion, having attained a production of $102,291,686 in the year 1911; and

"Whereas the value of the mineral production of Canada has shown a steady growth in having risen during the last decade from $63,231,836 to the first above-mentioned sum; and

"Whereas the further development of the whole mining industry of the Dominion of Canada can be materially aided by greater attention being paid to its requirements and possibilities; and

"Whereas the Canada Department of Mines is at present under the control of the Minister of the Interior, the work of whose department is so heavy that he cannot give to the Department of Mines the attention its great importance demands,

"Therefore be it resolvel, that in the opinion of this convention it is urgent that there be a separate Minister of Mines who will be free to give this department the attention essential to the further development of the mineral resources and the best interests generally of the mining industry of Canada."

### DRILL FOR CUTTING SAMPLES.

Cnting samples in a mine where the ore is hard, tough, compact quartzite, such as is the banket ore on the Rand, or similar material, is a laborious task, often requiring half an hour per foot of sample. Mr. Noel Griffen has described in the Journal of the Chemical, Metallurgical and Mining Society of South Africa a method by which a small chipping hammer, not unlike a pneumatic rivetter adapted for carrying a cutting bit, can be used, greatly facilitating the cutting of mine samples. The chipping hammer recommended is an Imperial, size B, No. 1, weighing 10½ pounds. A rose bit 2 inches in diameter has been found preferable to any other shape. The clippings and dust are caught in a canvas bag, supported in an open position by a stiff wire or round iron frame, and measuring about 24 by 18 inches, so arranged that the drill bit can be passed through a hole in the bottom of the bag, the opening being reinforced by two washers to prevent tearing at the edge. The bag is held against the face and the bit directed by the left hand, while the handle of the drill is grasped by the right hand so that the controlling trigger can be operated by the right forefinger. The drill requires ½-inch air hose. It is stated that at first the drill is difficult to control, but after a few days' practice the operator becomes proficient enough to cut a channel 2 inches wide and ½ inch deep across the face of a drift at the rate of 2 feet in ten minutes in the hardest rock. The work requires much muscular exertion, but in tough ground far less exertion is required to cut a sample by machine than by hammer and moil. The rock cut out by the rose bit ranges from powder to chips half the size of a pea, so that if any larger pieces flake off beyond the edges of the desired channel they may be readily removed by screening. It is said that if the drill is held well up against the face the chips do not fly as much as when sampling is done by hammer and moil.

# STATISTICS AND RETURNS

### BUFFALO MINES FOR DECEMBER.

Buffalo Mines, Ltd., reports for December: Mill ran 582 hours, ore milled 4,616 tons; average assay portion before milling 44.16 ounces; silver recovered 178,371 ounces and silver paid for during month shipped previously 33,179 ounces.

### HILLCREST COLLIERIES.

From Hillcrest Collieries, Limited, is reported steady progress at the property and the demand for the company's coal is excellent. The progress made in the past two years may be seen by the comparative figures for January 1913, 1912, and 1911, as follows:

| | |
|---|---|
| Jan. 1911 | 8,375 tons |
| Jan. 1912 | 11,805 tons |
| Jan. 1913 | 17,800 tons |

The new plant is proving satisfactory. The annual meeting will be held March 4th.

### DOMINION STEEL JANUARY OUTPUT.

The output of the Sydney plant of the Dominion Steel Corporation, Limited, for January was as follows:

| | |
|---|---|
| Pig iron | 27,164 tons |
| Steel ingots | 28,022 tons |
| Blooms | 25,809 tons |
| Rails | 14,410 tons |
| Wire rods | 3,092 tons |

The coal output in the Cape Breton collieries for the month was 414,944 tons, as compared with 320,091 tons in 1912.

### McKINLEY-DARRAGH IN JANUARY.

During the month of January the McKinley-Darragh Savage mines produced 180,000 ounces the cleaning-up process, which is the rule at most of the mines in the camp, cutting down the tonnage somewhat. Owing to the very heavy program of development at the Savage, and the alterations proposed to the plant there, the Savage only contributed 20,000 ounces.

### B. C. ORE RECEIPTS.

The Consolidated Mining & Smelting Co., of Canada, Limited, ore receipts at Trail Smelter for the week ending February 1, and from July 1 to date, in tons:

Company's mines:

| | Week of Feb. 1 | July 1 to date |
|---|---|---|
| Centre Star | 2,568 | 93,835 |
| Le Roi | 1,579 | 27,081 |
| Sullivan | 720 | 17,975 |
| Molly Gibson | 128 | 1,277 |
| St. Eugene | ..... | 801 |
| Richmond-Eureka | ..... | 778 |
| No. 1 | ..... | 153 |
| Other mines | 1,371 | 45,643 |
| Balance | 6,366 | 187,543 |

### VAN ROI.

Cable:—"Mill report for December: Total amount crushed, 3,334 tons (average assay 8.9 ozs. silver, 2.5 per cent. lead, 5.0 per cent. zinc), yielding 106 tons lead concentrates, assaying 129.9 ozs. silver, 56.5 per cent. lead, 14.3 per cent. zinc; and 124 tons zinc concentrates, assaying 42.0 ozs. silver, 3.7 per cent. lead and 44.0 per cent. zinc. Mill ran 596 hours. Total approximate value, $12,557 (£2,589). Estimated expenditure for corresponding period—Development $2,195, ore production $11,796, milling $3,200—$17,191 (£3,544). Capital expenditure, $203 (£42). Westward drift, level 7—Breast is 1,453 feet west of portal. Advance 118 feet driven. Promising. Westward drift, level 9—Breast is 1,338 feet west of portal. Advance 74 feet driven. Promising. Drift eastward—35 feet up. No. 3 intermediate raise above level 2—Advance 32 feet, of which 25 feet averaged 20 ozs. silver, 4 per cent. lead, 5 per cent. zinc, across 6 feet."

## MARITIME COAL SHIPMENTS.

**Coal Shipments, January, 1913, Dominion Coal Co., Ltd.**

Output and shipments for January, 1913:

| | Output. | Shipments. |
|---|---|---|
| Dominion No. 1 | 44,788 | |
| Dominion No. 2 | 65,793 | |
| Dominion No. 3 | 11,042 | |
| Dominion No. 4 | 32,549 | |
| Dominion No. 5 | 20,901 | |
| Dominion No. 6 | 20,322 | |
| Dominion No. 7 | 18,185 | |
| Dominion No. 8 | 8,255 | 267,795 |
| Dominion No. 9 | 33,144 | |
| Dominion No. 10 | 19,091 | |
| Dominion No. 12 | 27,972 | |
| Dominion No. 14 | 30,241 | |
| Dominion No. 15 | 17,277 | |
| Dominion No. 16 | 18,973 | |
| Dominion No. 21 | 13,089 | |
| Dominion No. 22 | 2,749 | |
| | 384,361 | |

| | |
|---|---|
| Shipments, January, 1913 | 267,795 |
| Shipments, January, 1912 | 186,346 |
| Increase, January, 1913 | 81,449 |

**Springhill.**

| | |
|---|---|
| Shipments, January, 1913 | 22,003 |
| Shipments, January, 1912 | 28,732 |
| Decrease, January, 1913 | 6,729 |

**Inverness Railway & Coal Co.**

| | |
|---|---|
| Shipments, January, 1913 | 21,960 |
| Shipments, January, 1912 | 22,679 |
| Decrease, January, 1913 | 719 |

**Acadia Coal Co.**

| | |
|---|---|
| Shipments, January, 1913 | 40,539 |
| Shipments, January, 1912 | 30,964 |
| Increase, January, 1913 | 9,575 |

## COBALT ORE SHIPMENTS.

The shipments from the Cobalt camp for the week ending February 15, amounted to 332.25 tons from nine members. But two of these shipments were of low grade ore. The bullion all went out in one day, on Tuesday, and constituted a record for the camp and probably for the Dominion, three mines shipping about $190,000 in silver bars. Shipments were as follows:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Cobalt Lake | 1 | .. | 39.00 |
| Peterson Lake (Seneca-Superior lease) | 1 | .. | 31.75 |
| Drummond | 1 | .. | 42.10 |
| Nipissing | .. | 1 | 42.00 |
| McKinley-Darragh | 2 | .. | 59.27 |
| Hudson's Bay | 1 | .. | 30.70 |
| Coniagas | 1 | .. | 24.24 |
| La Rose | 1 | .. | 32.94 |
| Beaver | 1 | .. | 30.25 |
| | 9 | 1 | 332.25 |

**Bullion Shipments.**

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 176 | 214,206 | $132,807 |
| Crown Reserve | 15 | 15,691 | 9,354 |
| Dominion Reduction | *72 | 79,200 | 45,405 |
| | 263 | 308,997 | $187,567 |

*Estimated.

## LA ROSE MINE IN JANUARY.

The January statement of La Rose is not quite as good as the preceding month.

Production for January was 219,977 ozs., with a value of $134,724. This plus a sundry income of $3,741, gives a total income for the month of $138,465. From this amount is deducted $62,187 for market expenses, etc., leaving January profits of $76,278.

The cash surplus totalled $1,324,290, plus outstanding shipments of $229,978 or a total of $1,548,268.

Ore on hand ready for shipment totals $53,913.

The total cash surplus stands at $1,602,181.

The actual cash surplus on December 31, 1912, was $1,667,104.

## NIPISSING IN JANUARY.

During January, Nipissing mined ore of estimated net value of $204,780, and shipped ore estimated at $170,377 net. The decrease in the shipments is due to the annual clean-up at the high grade mill. At 20 feet of milling ore is being opened up. Shaft 64 has reached a depth of over 560 feet, and in 100 feet station will be cut.

## B. C. ORE SHIPMENTS.

Week ending February 8th.

| | Week. | Year. |
|---|---|---|
| **Boundary.** | | |
| Total | 36,428 | 193,887 |
| **Nelson.** | | |
| Total | 1,764 | 13,029 |
| **Slocan and Ainsworth.** | | |
| Total | 3,957 | 19,745 |
| **East Kootenay.** | | |
| Total | 463 | 4,209 |
| **Lardeau.** | | |
| Other mines | .... | 65 |
| **Rossland.** | | |
| Total | 5,130 | 27,087 |
| **Granby Smelter Receipts.** Grand Forks, B.C. | | |
| Granby | 24,616 | 115,414 |
| **Consolidated Co.'s Receipts.** Trail, B.C. | | |
| Total | 6,626 | 35,836 |
| **B. C. Copper Co.'s Receipts.** Greenwood, B.C. | | |
| Total | 9,880 | 69,302 |
| **Zinc Shipments.** | | |
| Noble Five | 65 | 65 |
| Van Roi | 169 | 169 |
| Standard | 125 | 125 |
| Total | 359 | 359 |

## B. C. ORE SHIPMENTS.

Week ending February 15.

What was probably the first shipment of ore sent out from the north of the province over the new Grand Trunk Pacific Railway line to Prince Rupert was smelted last week at the Consolidated Mining & Smelting Company's plant at Trail. The ore came from the Silver Standard mine at Hazelton, a property owned by J. W. Stewart, of Foley, Welsh & Stewart, and partners. From Prince Rupert the ore was shipped by steamer to Vancouver and then brought to Trail over the Canadian Pacific line.

Four properties in Kootenay were added to the year's shipping list during the week. They were the Lily B., Fidelity, Nickel Plate, and Hope.

Ore production in the Kootenay and Boundary districts last week totalled 47,764 tons, and for the year to date 309,606 tons. Smelter receipts for the week ending February 15 were 42,101 tons, and for the year to date 263,163 tons. Production in detail was:

### Boundary.

| | Week. | Year. |
|---|---|---|
| Granby | 24,546 | 139,800 |
| Mother Lode | 5,520 | 41,955 |
| Rawhide | 5,091 | 30,510 |
| Napoleon | 595 | 4,629 |
| Knob Hill | 72 | 509 |
| Ben Hur | 243 | 755 |
| United Copper | 165 | 636 |
| Jewel | 28 | 63 |
| No. 7 | 137 | 222 |
| Nickel Plate, milled | 1,500 | 10,500 |
| Jewell, milled | 200 | 1,400 |
| Other mines | .... | 945 |
| | 38,097 | 232,084 |

### Lardeau.

| | | |
|---|---|---|
| Ajax | 32 | 68 |
| Other mines | .... | 29 |
| Total | 32 | 97 |

### East Kootenay.

| | | |
|---|---|---|
| Sullivan | 565 | 4,605 |
| St. Eugene | 34 | 203 |
| Total | 599 | 4,808 |

### Nelson.

| | | |
|---|---|---|
| Queen Victoria | 296 | 3,262 |
| H. B. | 304 | 1,194 |
| Emerald | 81 | 277 |
| Mother Lode, milled | 500 | 3,500 |
| Granite-Poorman, milled | 250 | 1,750 |
| Queen, milled | 400 | 2,800 |
| Second Relief, milled | 200 | 1,400 |
| Other mines | .... | 876 |
| | 2,030 | 15,059 |

### Rossland.

| | | |
|---|---|---|
| Centre Star | 2,256 | 16,230 |
| Le Roi | 727 | 8,822 |
| Le Roi No. 2 | 449 | 2,753 |
| Nickel Plate | 30 | 30 |
| Le Roi No. 2, milled | 350 | 2,450 |
| Inland Empire | 90 | 630 |
| Other mines | .... | 74 |
| | 3,902 | 30,989 |

### Slocan and Ainsworth.

| | | |
|---|---|---|
| Standard | 436 | 1,652 |
| Bluebell | 278 | 1,264 |
| Rambler-Cariboo | 33 | 376 |
| Van Roi | 64 | 190 |
| Utica | 28 | 190 |
| Lily B. | 15 | 15 |
| Hope | 39 | 39 |
| Fidelity | 11 | 11 |
| Standard, milled | 500 | 3,500 |
| Bluebell, milled | 1,200 | 8,400 |
| Van Roi, milled | 1,100 | 7,700 |
| Kilo, milled | 100 | 700 |
| Rambler-Cariboo, milled | 300 | 2,100 |
| Other mines | .... | 532 |
| | 3,104 | 26,569 |

### Granby Smelter Receipts.

Granby Forks, B. C.

| | | |
|---|---|---|
| Granby | 24,456 | 139,960 |

### B. C. Copper Co.'s Receipts.

Greenwood, B. C.

| | | |
|---|---|---|
| Mother Lode | 5,520 | 41,955 |
| Rawhide | 5,091 | 30,510 |
| Napoleon | 595 | 4,629 |
| Queen Victoria | 295 | 3,262 |
| Other mines | .... | 547 |
| | 11,501 | 80,903 |

### Consolidated Co.'s Receipts.

Trail, B. C.

| | | |
|---|---|---|
| Centre Star | 2,256 | 16,230 |
| Le Roi | 727 | 8,822 |
| Le Roi No. 2 | 449 | 2,753 |
| Nickel Plate | 30 | 30 |
| Sullivan | 565 | 4,605 |
| St. Eugene | 34 | 203 |
| H. B. | 304 | 1,194 |
| Emerald | 81 | 277 |
| Ajax | 32 | 68 |
| Standard | 436 | 1,652 |
| Bluebell | 278 | 1,264 |
| Rambler-Cariboo | 33 | 376 |
| Van Roi | 64 | 190 |
| Utica | 28 | 90 |
| Lily B. | 15 | 15 |
| Hope | 39 | 39 |
| Fidelity | 11 | 11 |
| Knob Hill | 72 | 509 |
| Ben Hur | 243 | 755 |
| United Copper | 165 | 636 |
| Jewel | 28 | 63 |
| No. 7 | 137 | 222 |
| Hazelton Standard | 28 | 28 |
| Other mines | .... | 1,090 |
| | 6,054 | 41,941 |

### SILVER PRICES.

| | New York. cents. | London. pence. |
|---|---|---|
| Feb. 8 | 62¼ | 28⅝ |
| " 10 | 61⅞ | 28 7/16 |
| " 11 | 61⅞ | 28 7/16 |
| " 13 | 61¾ | 28 7/16 |
| " 14 | 61¾ | 28 7/16 |
| " 15 | 62⅛ | 28 9/16 |
| " 17 | 62 | 28½ |
| " 18 | 62 | 28½ |
| " 19 | 62 | 28½ |
| " 20 | 61⅝ | 28⅜ |
| " 21 | 61⅝ | 28⅜ |

# CANADIAN MINING INSTITUTE.

By J. C. MURRAY

A national organization that has an active membership of more than 1,000, including technologists and business men of all grades from the professor to the promoter, from the geologist to the prospector, from the managing engineer to the investor, is bound to exercise large influence on the country's life. The Canadian Mining Institute is not only national; it has important international connections and affiliations. Its members are distributed all over the world. Its publications reach South America, Asia, Europe, Africa, and Australia, beside having wide circulation in Canada and the United States. Hence they are uniquely valuable media for the dissemination of information. Official correspondence is maintained with representative foreign members, and the accounts of the annual meetings reach every important country in the civilized world and many remote mining districts.

The annual meetings have been, and are, remarkably interesting in character. Professional papers, the cream of current technical thought, historical and economic treatises, are read and discussed. Important questions of trade, of politics, and of ethics are debated, and wide publicity is given to the Institute's resolutions. At the social functions that are part of the annual proceedings, to wit, the dinner and the smoker, the nation's leading legislators and officials are honoured guests. The smoker, by the way, has developed into an outstanding event. Free rein is given the reckless ingenuity of certain members, and the results are often amazing. Honoured, if somewhat irregular and unconventional customs, mark the evening of the smoker. It is unnecessary to expatiate upon these. The arcana of the Institute when it "stands easy" need not be explained. Each member must learn for himself.

The Institute is much more than a technical society. It is a brotherhood. In a mild way, masonry is its archetype. The isolated mining man can count upon at least one annual foregathering with his fellows and his friends. He comes, therefore, to the place of meeting determined to learn what he can, to have a thoroughly good time, and to take his part dutifully in the proceedings. During the three days he meets friends, old and new; rubs elbows with novices and notabilities, hears speeches excellent and otherwise, keeps reprehensibly irregular hours, and leaves refreshed, inspired, and ready for another long year of labour. How much good he receives cannot be estimated; but it is beyond doubt that the atmosphere of the convention is charged with beneficent influence. The man who is not responsive or receptive has only himself to blame.

Unlike other professional societies, the Canadian Mining Institute is neither a close nor an exclusive corporation. Although to attain full membership the applicant must show that he has had ample experience in some branch of mining, and although these requirements have been made more rigid of late years, yet associate membership is open to the non-technical of all kinds and degrees.

Hence there exists in the ranks of the Institute, particularly as represented at the annual meeting, a very profitable variety of human types and human attainments. The lawyer, the investor, the prospector, the metallurgist, the organizer, the journalist, the geologist, the chemist, the mine manager, the government official, all will be present at the forthcoming meeting in Ottawa. This condition is, naturally, most desirable. The diversity of men and manners imparts zest to the proceedings.

It is obvious that the Canadian Mining Institute possesses, consciously or unconsciously, decided powers for good. That these powers are exercised wisely goes without saying. That they should be more profoundly felt is axiomatic. The Institute has achieved solidarity socially, but not yet in a political sense. The necessity for such solidarity is too apparent to require demonstration. While it would be destructive and futile to interfere with party politics, yet the Institute must be prepared effectually to face certain grave and critical situations. Such a situation exists at the present moment.

The functions of the Institute are many. It is called upon to express itself on questions of legislation and administration. It plays an important part in receiving and entertaining foreign delegations. In fact, the Institute is the only suitable organization for purposes of this kind. We have touched already upon its publications and its social aspects. These are all vital. But in themselves they are quite subordinate to the duty of safeguarding the mining industry. Occasions arise when it is imperative that the Institute be not only heard, but felt. Wise guidance, long deliberation, and dignified action are essential. Recognition of the fact that individually and collectively the members of the Institute can exercise large influence on the electorate is even more essential. That such influence, largely formative, and educational, should be exercised, implies nothing invidious. It were weak and foolish to blink facts. The Institute cannot confine itself merely to the formulation of protests. It should and must use every legitimate means to attain its legitimate ends. In fact, the

# PORTRAITS, NEW AND OLD—MOSTLY OLD

THE LATE B. T. A. BELL,

Parent of the Institute. He made history. His works do follow him.

T. W. GIBSON,
Deputy Minister of Mines for Ontario.
This is from a Victorian Photograph.

HON. L. CODERRE, Minister of Mines.

A. P. LOW, Deputy Minister of Mines.

Paleozoic Picture of Mr. Low.

Institute must take itself seriously as a factor in the national life of Canada.

And this rests but in small measure with the Secretary and the Council. Every member must put his shoulder to the wheel. The thoroughly concerted action of one thousand responsible Canadian citizens should be adequate for the attainment of almost any object within the scope of the Institute's activities.

. . . . .

In both the territorial and the class sense the Institute is representative. Every Canadian province sends delegates to the annual meeting. The membership embraces men of all shades of opinion, of all grades professionally, and of many nationalities. Canadians form, of course, the preponderating majority. But Americans, Englishmen, Germans, and others, are sufficiently numerous to leaven the mass. In any movement of a serious nature, in any crisis, therefore, the Institute can count upon the disinterested advice of eminent outsiders. Thus the Canadian Mining Institute is most fortunately constituted. Its functions, while largely deliberative and social, are also administrative and executive. From its size and its composition it commands respect.

The time has arrived for the Canadian Mining Institute to undertake resolutely the solution of national problems. Closer identification with the industry and a more active participation in legislative affairs are crying needs.

. . . . .

I had really intended to make this short article a constructive appreciation of the work of the Institute. The editorial habit of mind, however, is painfully didactic. Apparently the editor lives, moves, and has his being in constant fault-finding and preaching. It is easy to be captious. It may not be amiss, therefore, to take this opportunity of expressing warm appreciation of the labours of our President, our Councillors, and, by no means least, of our Secretary. Our President and Councillors devote time, energy, and, often, money, to the performance of their regular duties—duties that are not in the least nominal. The Secretary, despite his passion for drawing on us for unpaid fees, meets the multifarious calls upon his time with tact and patience. He must, perforce, act like a regular "harumphrodite"—soldier and sailor too. He is editor, advance agent, treasurer, organizer, traffic agent, entertainer, and many other things to all men. Only once or twice a year is it permitted him to have a really good time. Not more than a baker's dozen of us can recall having heard the Secretary raising his voice in midnight, or matutinal song. His is not a cheerful life. Yet he smiles and smiles—and signs certificates, and argues with recalcitrant geologists, and bothers the life out of you and me for our perennial fees and our long-promised papers.

Verily we have a superfine lot of Councillors and an exceeding patient and decent Secretary. How they all get along with so few feuds and internecine wars is not for me to say. The roots of sin and the lust of battle are there. But the balance of power is rarely disturbed. Institute affairs come first, and personal ambitions a distant second.

. . . . .

In every natural organism there are forces at constant war each with the other. Our bodies are the battlegrounds of numberless bacilli, bacilli benign and bacilli malign. Much of the good that we accomplish is brought about by the antagonism of evil. The analogy carries. The Institute has in its time been rent asunder by factions and parties. Toronto and Montreal were at daggers drawn for years. Better feeling was engendered. Epics could be written of encounters between such doughty warriors as Coste and Brown, Haultain and Porter, and other equally warlike personages. Elections have often come within measurable distance of black eyes. Sectional fights to a finish were numerous. Whether because of lassitude, or of waxing dignity, or of a better general understanding, these disturbances appear to be things of the past. Such finished diplomats as Miller, Adams, and Smith, no longer think it worth while to stir the fighting blood of the Institute. It cannot be said, however, that there is any lack of pugnacity and good clean love of battle. Petty jealousies have disappeared. There remain many potent influences that require harnessing and direction. The leaders of the Institute will find no difficulty in utilizing these forces in constructive work for the good of the mining industry. A grand destiny awaits the Institute if we but wake in time.

. . . . .

A sister society, of which many of us are members, has just passed through a trying, and disturbing experience. That the Canadian Mining Institute has enjoyed several years of practically unbroken peace is much to the credit of our Councillors, our Presidents, and our Secretary. It speaks volumes for the manner in which the affairs of the Institute are administered.

## THE PORTRAIT GALLERY

The portraits that appear herewith cover many years of the Institute's history. They include officials old and new. Reference to the Institute's published list will throw more light upon the standing of each. It may be added that the size of each portrait has been determined by quite arbitrary circumstances.

# TO THE INSTITUTE

Such doggerel as this, I trow,
Should not be printed in the Journal;
It surely merits here and now
Condignest torment, sempiternal!

. . . . .

From many countries, many climes,
The sons of Martha hasten here,
Each big with much unspoken thought,
Each filled with much unspoken fear
That he will miss the smallest jot
Of what is done or what is not.

. . . . .

Here comes from the metropolis
The gladsome Barlow, who, surprised
And captured the acropolis
Of long ambition realized.
Comes also Miller from the west—
Observe the twinkle in his eye.
His pose of a misogynist
Is not convincing by-the-bye.
And who is this with suavest smile,
Restrained, impersonal, and bland,
As one that you might know long while
Ere you could diagnose his hand?
That, that is Adams of McGill,
The man who made hard marble flow,
And, though we cannot cherish ill,
He treated us precisely so.
And who comes next, dark-visaged, gloomy,
Unsmiling, capable, and cold,
His countenance presaging doom, he
Looks ripe for action swift and bold;
None other this than Bonsall Porter
That most resourceful child of guile,
In politics a rip-tailed snorter
With many a trick and many a wile.
Hard after him there follows smiling
A brisk and truculent confrere;
His manner sharp and not beguiling,
Like—well—a tiger in his lair.
Haultain it is, there's no mistaking
His attitude on anything;
His thirst (for rows) there is no slaking,
His praises students many sing.
There follows one with brow so high
It runs back nearly to his collar;
'Tis A. A. Cole, who's passing by,

DR. W. G. MILLER.
Recent alterations give this picture merely historic value.
Mr. Miller has been ever the power behind the Throne.
Notice the Machiavelian expression.

DR. A. E. BARLÓW.
A poor portrait of our respected President.

CHARLES FERGIE.
Pre eminent in wrestling circles.
Not unknown as a coal
mining engineer.

FREDERIC KEFFER, Past-President.
A thoughtful, benign and conciliating person.

R. R. HEDLEY,
who looks, and is, a good citizen.

A. B. W. HODGES,
lately returned from Cerro de Pasco.

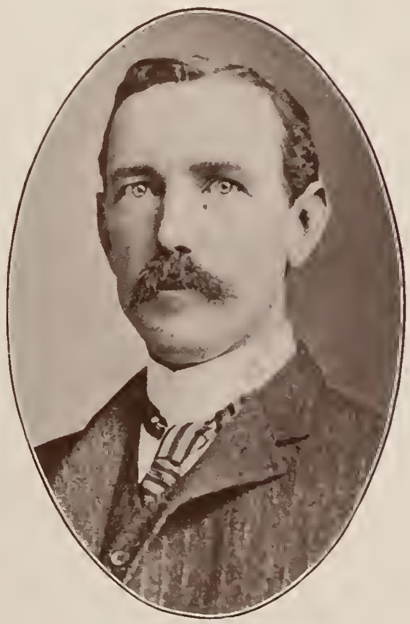
Calm, self-contained, when others holler.
Bull-throated Foghorn next I view,
A child of nature, surely;
Moreover, it is just and due
To state that most securely
Old Mac can handle more good Scotch
Than anyone we know, sir,
And he can kick up quite a splotch
When once he starts to go, sir.
The Colonel comes in Foghorn's wake,
A jaunty, cheerful figure;
A martial noise he seems to make
His style is quite *de rigueur.*
You'll see him later on, I ween.
Assisted by the Major,
Each is and each has ever been
An excellent old stager.
And now there bursts upon our view
A person most excited,
He looks at me and then at you
To see if we're invited.
He wears a harried worried air
As if the trump had sounded,
As if his woes he can not bear
He is so teased and hounded.
It is not hard to guess his name
A double-barreled label—
My muse has gone so cursèd lame
These lines resemble Babel.
'Twere quite unfair to many good
Substantial souls like Penhale
Who do their best, as heroes should,
When feeling ill or *when* hale,
To overlook their many claims
To be embalmed in verse.
Of Penhale be it briefly noted
He *seems* a sport, or worse,
Whereas, he's properly devoted
To abstinence and tea.
And Ferrier must not be missed,
A regular Ulysses, he
Is quite at home with tuff or schist.
A man of firm opinion,
Canadian to the core,
To none could he become a minion,
You could not ask for more.

. . . . .

I wander farther than I ought to
Much farther than at first was planned
Much farther than I ever thought to—
My subject's rather out of hand.
So I shall simply say adieu!
Here's "How" to every one of you!

GEORGE R. SMITH, Past-President,
and past-master in politics and prestidigitation.

E. T. CORKILL,
Inspector of Mines for Ontario. Strong on explosives. Has put the fear of God into more than one operator.



JAMES McEVOY,
Coal Protagonist of Pontonie—academic controversies on burro back over the Rockies a specialty.

DR. F. D. ADAMS, Past-President.

Star witness in famous breach of promise case at our Quebec Meeting, 1911.

JOHN E. HARDMAN.

Forest fires have destroyed the spinach. Not now so godly of visage. An after-dinner artist and a true blue sport.

EUGENE COSTE,

The stormy petrel of the Institute. Mr. Coste has enlivened proceedings more than a little.

THOS. CANTLEY, N. S. Steel & Coal Co.,
(these are synonyms).

MAJOR R. W. LEONARD.
Beloved of G.T.P. contractors.

A. A. COLE,
Mining Engineer T. & N. O. Railway. Dry nurse to many Cobalt excursionists.

DR. EUGENE HAANEL,
Director of the Mines Branch. Savant, specialist and administrator.

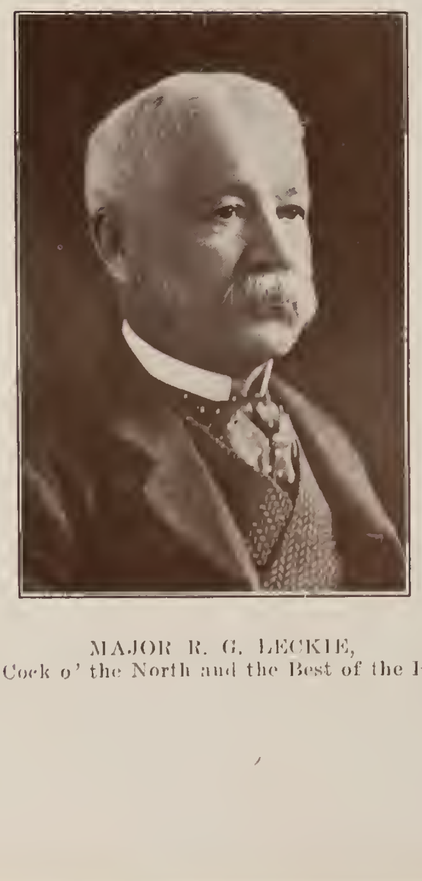
W. F. FERRIER.
Lately arrived from the States. A vehement Canadian. Discoverer of Canadian corundum.

H. MORTIMER LAMB, Secretary of the C. M. I.

G. G. S. LINDSEY,
An indefatigable official, organizer and entertainer.
Classified under the category of corker.

J. STEVENSON BROWN, Damon to Coste's Pythias.

DR. JAMES DOUGLAS, Scientist, Metallurgist and Author.



MAJOR R. G. LECKIE,
the Cock o' the North and the Best of the Bunch.

J. OBALSKI,
the former Superintendent of Mines for Quebec.

J. B. TYRRELL,
Explorer, geologist and author. Capable of unbending.

A. B. WILLMOTT.
Not now a partner of Julian Hawthorne.

J. C. GWILLIM,
Professor of Mining, Kingston.

R. W. BROCK, Director Geological Survey.
Much in need of a patriarchal beard. Otherwise beyond reproach.

DR. W. L. GOODWIN,
Director Kingston School of Mining. One of the Old Guard. Capable yet of staying up till after midnight.

COL. A. M. HAY,
without whom the Institute would cease to interest us.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a t' orough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

**Dominion of Canada.**
**Ontario**
Astley, J. W.
Bewick, Moreing & Co.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Hore, R. E.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Miles, A. D.
Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
Spencer, W. H.
Sutcliffe, & Neelands
Tyrrell, J. B.
Willmott, A. B.

**Quebec**
Cohen, S. W.
DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Obalski & Dulieux
Ross, J. G.
Woolsey, W. J.

**British Columbia**
Ashworth, James
Fowler, S. S.

**FOREIGN-New York**
Hassan, A. A.
Hore, R. E. Houghton, Mich.
Constant, C. L. & Co.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

**Dominion of Canada**
**Ontario**
Brown, A. H.
Campbell & Deyell
Heys, Thos. & Son.
John, D.
Canadian Laboratories, Ltd.
McNeill, W. K., Manager

**Quebec**
Hersey, Milton Co., Ltd
Obalski & Dulieux
Dr. J. T. Donald

**British Columbia**
Bryant C. M. & Co.

**Foreign-New York**
Ledoux & Co.
Carey, E. E., Cal.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

**ASHWORTH, JAMES**
MEMB. S. W. I. E.
Consulting Mining Engineer,
General Manager Crows Nest Pass Coal Co.
1909—1911
1109 Hornby St. VANCOUVER, B. C

**ASTLEY, J. W.**
Consulting Mining Engineer,
24 King Street West,
TORONTO, CANADA.
Phone M, 5199, Code: Bedford McNeill

**CARTER & SMITH**
Consulting Mining Engineers
448-449 Confederation Life B'ldg
TORONTO
W. E. H. Carter, B.A.Sc. Alex. H. Smith, M.I.M.M.

**COHEN, SAMUEL W., E. M.**
Consulting Engineer,
Room 601, Dom. Express Bldg. Montreal
General Manager,
Crown Reserve Mining Co. Ltd.
Cobalt, Can.

**Colvocoresses, George M.,**
*Mining Engineer*
43 Exchange Place
New York City

**DEPENCIER, H. P.**
Consulting Mining Engineer
Room 613, Dominion Express Bldg.,
MONTREAL.
Phone Main 4984 P. O. Box 763

**EVANS, J. W.**
Mining Engineer,
Mines and Mining Properties examined and reported upon.
BELLEVILLE, ONTARIO.

**FORBES, D. L. H.**
Mining & Metallurgical Engineer
306 Manning Chambers, Toronto, Ont.
Mine Examination and Consultation.
Metallurgical Engineer for Merrill Metallurgical Co.

**FOWLER, S. S.**
Mining Engineer,
NELSON, B. C.

**FERRIER, W. F.**
Mining Engineer and Geologist
204 Lumsden Bldg., Toronto, Ont.
General Manager, Natural Resources Exploration Co., Limited.

**FORBES, H. L. M.Sc.,**
Mining Engineer
77 Sparks Street., OTTAWA, CAN
Specialty: Mica Phosphate.

**GWILLIM, J. C.**
Consulting Mining Engineer,
KINGSTON, ONT.

**GRAHAM, STANLEY N., B.Sc.**
Mining Engineer
ROOM 23 MANNING ARCADE
Phone Main 5199
24 KING STREET W., TORONTO

**HASSAN, A. A.,** COBALT, ONT.
Mining Geologist and Consulting Engineer.
61 Waldorf Court, Brooklyn, N. Y.
Special study and advice upon Ontario and Quebec mineral deposits, Including Cobalt and Porcupine.
Any Code. Cable Address: "Asghar"

**HILLE, F.**
Mining Engineer.
Mines and Mineral Lands Examined and Reported On.
Port Arthur, Ontario, Canada.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# BUYERS AND SELLERS OF METALS

# ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamators—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos. Hays & Son, 124 Yonge St., Toronto.
Canadian Laboratories, Ltd.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Allis-Chalmers-Bullock, Ltd.,
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.

**Beams—Steel—**
Dominion Bridge Co.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Belting—**
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.

**Blasting Batteries and Supplies—**
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Peacock Brothers.
John Davis & Sons.
Mussens, Limited.
Canadian Explosives, Ltd.

**Blowers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Boilers—**
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Robb Engineering Co., Ltd.
Canadian Ingersoll-Rand Co, Ltd.
John Inglis Co., Ltd.

**Buckets—**
Peacock Bros.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

**Building—Steel Frame—**
Dominion Bridge Co.
Canada Foundry Co.

**Cable—Aerial and Underground—**
Fraser & Chalmers, Ltd.

**Cableways—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

**Castings—**
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
C. O. Bartlett & Snow Co.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Crushers—**
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co, Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co, Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co. Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonsan Iron Works, Ltd.

**Excavators.**
Jeffrey Mrg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.
**Girders—Steel—**
Dominion Bridge Co.
**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**High Speed Steel Twist Drills—**
Mussens, Limited.
**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.
**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
**Injectors—**
Mussens, Limited.
Peacock Bros.
**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canaaian Ingersol-Rand Co., Ltd.
**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.
**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.
**Lights—Mine Bldg—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
**Link Belt—**
Watrous Engine Works.
Jones & Glassco.
**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.
**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.
**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.
**Monel Metal—**
Orford Copper Co.
**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.
**Nickel—**
Can. Copper Co.
**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.
**Ore Testing Works—**
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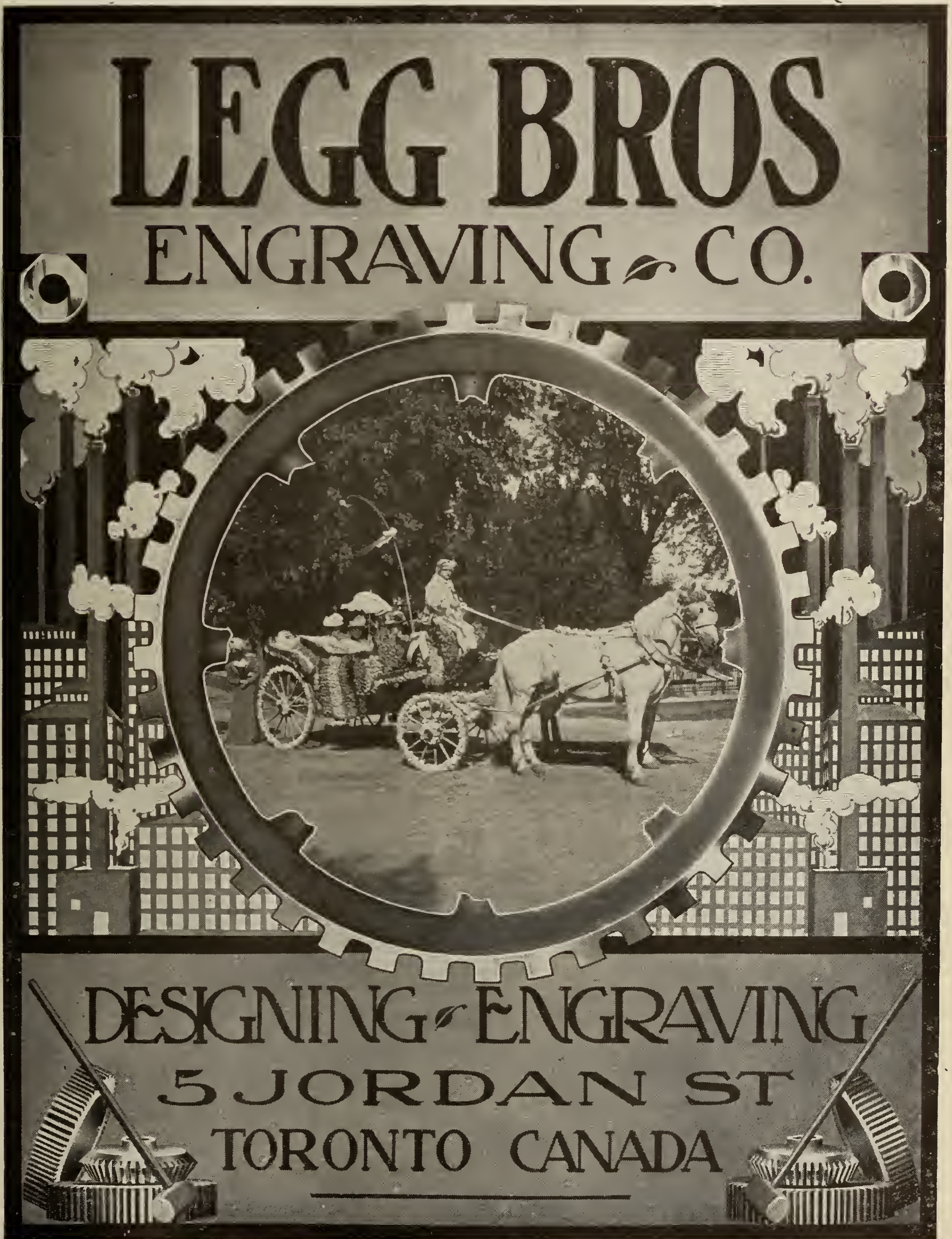
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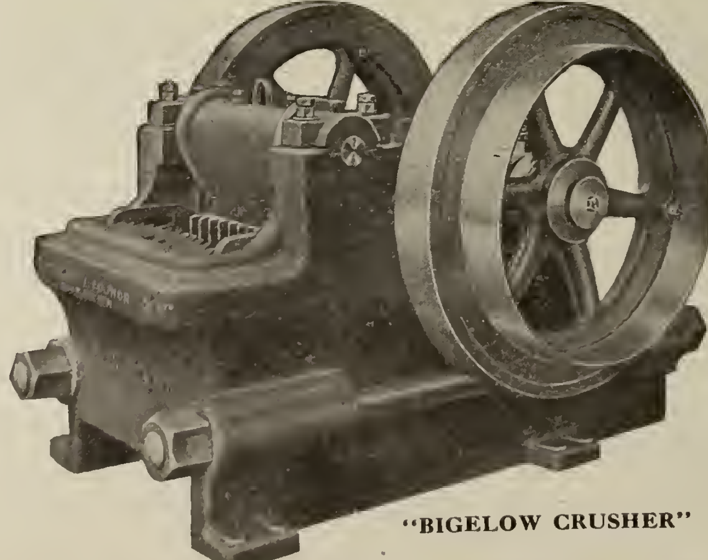

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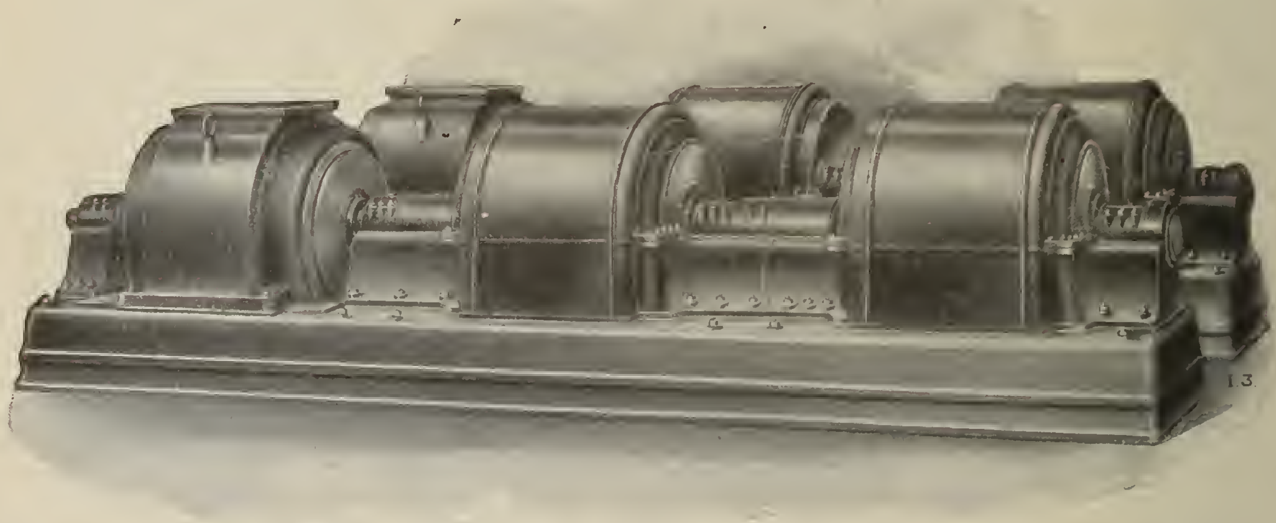

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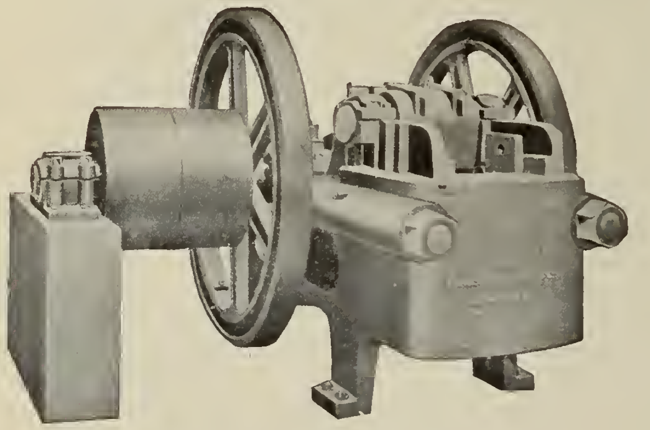

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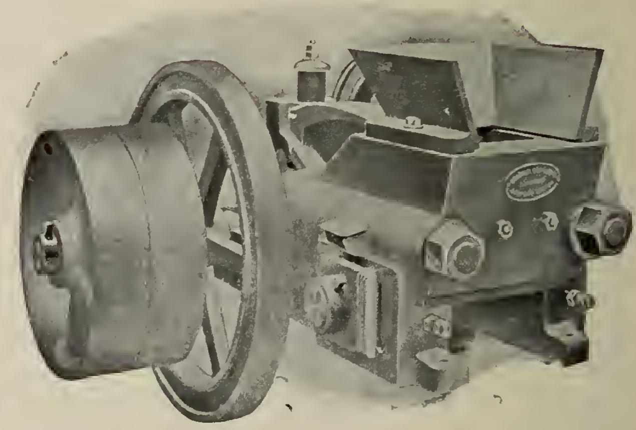

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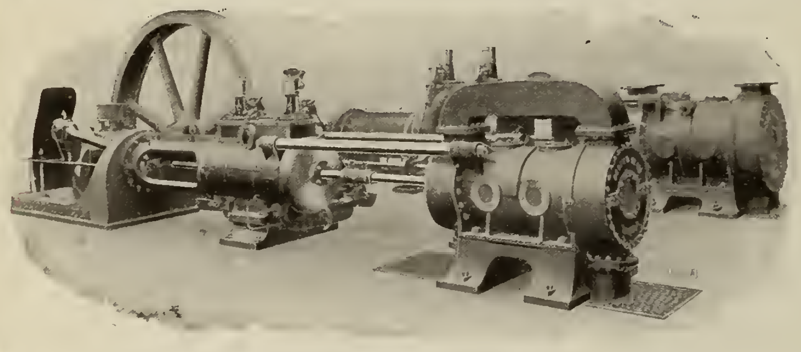

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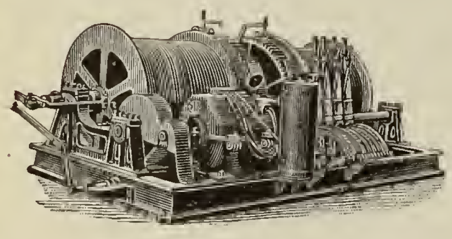

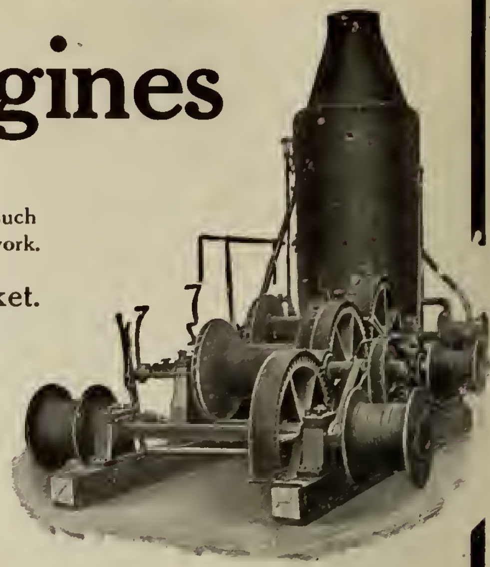

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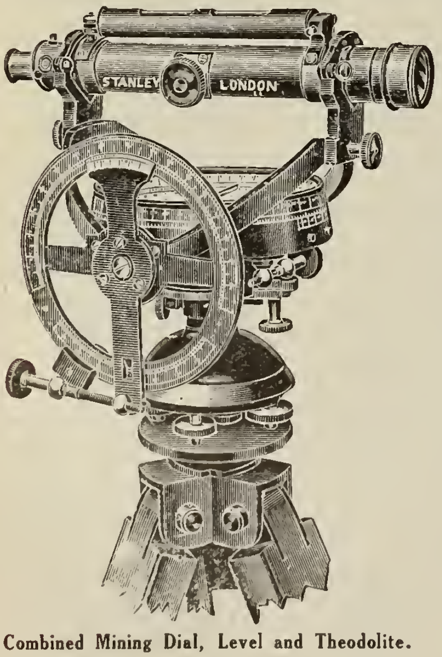


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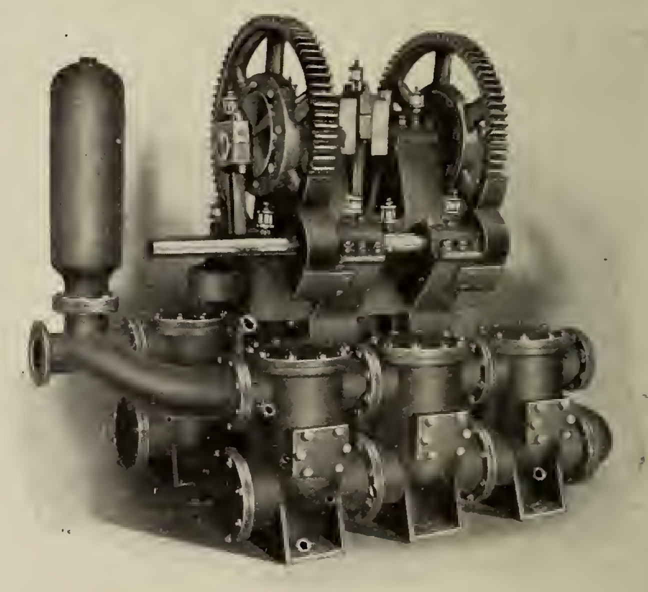

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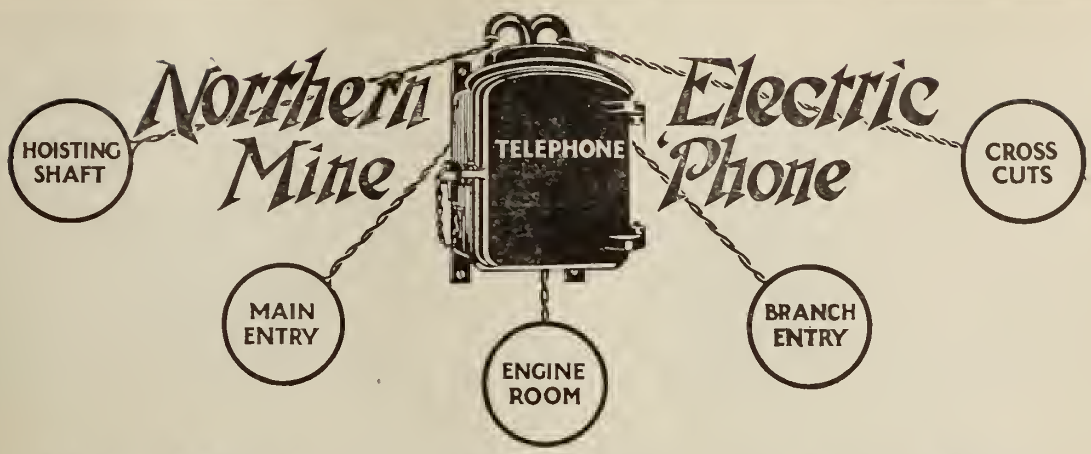


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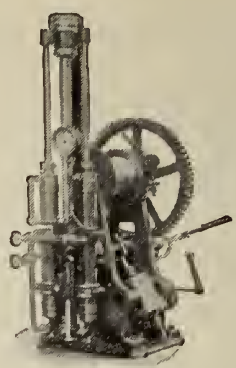

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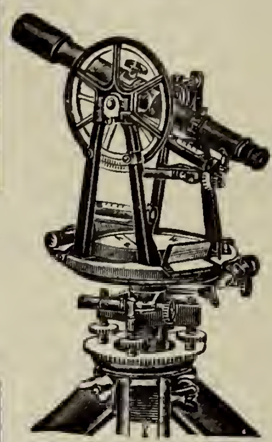

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CONTENTS.



## THE FIFTEENTH ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE

Much was expected of the Institute's fifteenth annual meeting. Expectations were not dissapointed. The Ottawa Branch appointed a vigorous Executive Committee. Aided by members of the Geological Survey and others, this committee did its duty nobly. In fact, there was hardly a dull moment during the three days of session. The hotel accommodation and service were hyper-excellent. The new Chateau Laurier is a thing of beauty. Ottawa at last possesses an hotel for which it need not blush. The outstanding features of the whole meeting, apart from certain papers to which reference will be made later, were the business sessions, the smoker and the dinner. At the business sessions there were discussed resolutions submitted by two prominent members, supported by several others and criticized by several. The resolutions were defeated; but their end is not yet. In essence they met the approval of the whole assembly. In form they were not acceptable. In view of subsequent development we can see no adequate reason for the postponement of an obviously necessary duty. Sooner or later the Institute will pass these or similar resolutions.

The resolutions in question were foreshadowed in an editorial in our issue of March 1st. Since they were intended to embody the opinion of the Institute, and did not take the form of a memorial to the Government; and since no more effective occasion could possibly have been chosen, it seems indeed superfluous to have permitted considerations of expediency to have overruled all else. A request for an entirely autonomous Domonion Department of Mines is reasonable. They express the Institute's need of more action—participation in legislation is neither undignified nor untactful. To impress the importance of the mining industry upon the country's representatives is neither untimely nor reprehensible. In fact, both the Premier and Sir Wilfrid Laurier gave evidence in their admirable speeches on Friday night of their general desire to do everything possible for the industry. We believe that both might have spoken more strongly had they had as a working basis a carefully worded resolution from the Institute. Hence it follows that a rare opportunity was missed. It remains for the Council to take the matter up as promptly as is feasible. In fact, a letter vote may prove a satisfactory remedy for the miscarriage at Ottawa.

The reading of Dominion and Provincial statistics brought out a most satisfactory state of affairs. The enormous growth of the mining industry during 1912 was amply demonstrated. His Royal Highness the Duke of Connaught, Governor-General of the Dominion of Canada, formally opened the proceedings in a felicitous and graceful speech. His Royal Highness, moreover, had the privilege of listening to a description of the Sudbury ore deposits by Dr. A. P. Coleman.

Dr. Coleman used none but a few necessary technical terms, and it would be hard to conceive of anything more lucid, instructive and interesting than his brief talk. Would to high Heaven all speeches were like his!

It is a matter of congratulation that the Institute can command such sterling papers as those presented by Dr. James Douglas, to whom, by the way, all the members should be grateful for his unceasing and active interest in the society. Of the great bulk of the papers read it may be asserted that they were well up to the average. Professor H. E. T. Haultain's address on "The Geologist" was a carefully prepared statement on a very delicate subject. Not only was it well received, but it excited more discussion than did any other. It was at once an appreciation of the geologist and calm, though searching, analysis of the relationship subsisting between him and the mining engineer. It was well and heartily received.

The brief announcement on the programme that, on Thursday evening, "a smoking concert will be held in the ball-room of the Chateau Laurier at 8 p.m.," was totally misleading. An enthusiastic audience was treated to a "Diastrophic Musical Tragedy," the alteration titles of which were, "The Mining World, or the Stinging Wildcat of Cobalt." Two of the leading characters in the tragedy were studied replications of two eminent Canadian geologists—one of whom has not been unconnected with Cobalt, the other not far distant from the presidential chair. Both were portrayed to admiration. The remaining characters were composite pictures of types ranging from the bemonocled English expert to the capable bartender. While the bar was the real motiff of the play, there was sufficient geology intermixed to serve the true and right purpose of confounding facts. Intelligent as was the audience, it is nevertheless a sad fact that many of the best points passed without applause. The apparently unrehearsed incidents of the play threw new light upon the characters of Messrs. Barlow, Denis and Obalski. These were the actual culmination of the tragedy. The audience was not infrequently moved to tears.

* * * *

As for the annual dinner it is difficult to speak in terms of too warm appreciation. The presence of the Premier, Sir Wilfrid Laurier and of other distinguished guests, lent diginity and meaning to the occasion. The speeches of both the first-named gentlemen and of Senator Pope were of prime importance to the future of the industry. The position of those who submitted the rejected resolutions was fully sustained.

To the Ottawa Branch the success of the meeting is in a large measure to be credited. They spared no pains. The President, Council and Secretary did all that in them lay to further that success. Special thanks, of course, are due to His Royal Highness, the Duke of Connaught, to the Rt. Hon. R. L. Borden, to Sir Wilfrid Laurier and to all the eminent gentlemen who honoured the convention with their presence. It is much to be regretted, however, that for the first time in years the Domonion Minister of Mines did not appear either at the ordinary sessions or at the dinner. Comment would be unfair, as we are ignorant of the reasons for the Hon. Mr. Coderre's apparent oversight. Yet it may be pointed out that the situation is open to several interpretations.

The praiseworthy attempt to arrange in groups the papers read was not as fruitful of good as we had hoped. Discussion lagged. The remedy for this is in the hands of the members. The President and the Secretary obviously did their best. However, this word of dispraise must not be taken too seriously. We may add that the papers themselves made amends for any defective arrangements. Possibly, and the matter can only be determined by trial, few papers might be presented.

* * * *

But in all essentials, in goodfellowship, in professional gain, in academic disquisition, and in social import, the fifteenth annual meeting of the Canadian Institute will go down into history as one of the most remarkable in the society's annals.

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# CANADIAN MINING INSTITUTE ANNUAL MEETING 1913.

## DR. A. E. BARLOW'S PRESIDENTIAL ADDRESS.

Before commenting on the main theme upon which I propose to address you on this occasion, it is fitting that I should make some reference to the work of the Canadian Mining Institute during the past year. To occupy the office of President of an Association such as ours, is, indeed, a high honour, but it also represents a heavy responsibility. I have been particularly fortunate during my tenure of office in receiving the loyal and enthusiastic support of the members, and it is most gratifying to be in a position to state that the Institute to-day is in a better and more flourishing condition than at any time in its history. If in the past there have been from time to time factional differences, these have now disappeared and in their place we have harmony and good will. Occasionally, however, a complaint is heard emanating usually from younger members of the society, that the Council is not sufficiently liberal in its support of the local branches or sections. The majority of those present to-day will doubtless remember that the financial assistance to branches was a question thoroughly discussed at the annual meeting held in Montreal four years ago (1909). At that meeting it was definitely decided that it would be unwise to adopt a policy that would cripple the parent association, and might well lead to its bankruptcy. The present sound financial position of the Institute is due to the conservative policy that the Council has persistently followed. The enviable position which the Institute occupies is largely due, therefore, to the unselfish interest and willing devotion of its officers and individual members. As a matter of fact, the members whose admission to the Institute is recent, that is to say, within the last four or five years, get a great deal more by way of return for their annual subscriptions than did their seniors in point of membership. The Canadian Mining Institute at the present time gives in actual monetary equivalent at least as good a return to its members as does any similar society in the world, while in comparison with many this consideration is much greater. Only recently I had occasion to refer to some of the earlier volumes of the Journal embodying the transactions of the society, and any member who will do the same and will compare these earlier publications with the annual volumes now issuing, will be as agreeably impressed as I was with the extraordinary difference from every point of view. The first volume of the transactions published in 1898 contains 66 pages, inclusive of the papers, reports of the general meeting, annual meetings, constitution and by-laws, and list of members. The next three volumes never exceeded 350 pages and were similarly inclusive of all the activities of the society. Many of the papers then submitted and published would unquestionably be rejected by our present Publication Committee. Errors of statement as well as those of typography are noticably frequent. In short, these earlier volumes, both as regards subject matter and manner of treatment are far from comparable with the Journals of the proceedings of the last few years, comprising as they do, volumes of 700 pages and upward of well written, carefully edited and adequately printed theses of a very high average quality.

With further reference to Branches, it may be affirmed that the Council appreciates the benefit accruing to the Institute as a whole from their establishment, and, if conditions permitted, would gladly contribute to their support. But as this is not at present possible, it is necessary that the officers of the respective Branches should encourage among their members that same spirit of unselfishnes which has ever characterized the Institute. If such an attitude be maintained and strengthened, the sphere of influence of the Institute will indeed be extended.

As has been well said by a former President, the Canadian Mining Institute represents an industry, not a profession. With this fact before us, and remembering the necessarily more open membership qualifiiation, there is evidently necessary a much greater degree of that esprit de corps which contributes so largely to the success even of those exclusive professional associations. Apropos of the increase of membership it is gratifying to note that last year constituted a record, the accessions representing no less than 197. The total membership at the end of February (1913) was 1,052, classified as follows:

MEMBERSHIP.

| | Dec. 31, 1912. | Elected in 1913. | Resignations. | 1913. |
|---|---|---|---|---|
| Patrons | 5 | .. | .. | 5 |
| Honorary | 3 | .. | .. | 3 |
| Corresponding | 13 | 3 | .. | 18 |
| Ex-Officio | 31 | .. | .. | 31 |
| Members | 737 | 22 | 5 | 754 |
| Associates | 125 | 3 | 5 | 123 |
| Life | 8 | .. | .. | 8 |
| Students | 15 | .. | .. | 15 |
| Affiliated | 97 | .. | .. | 97 |
| | 1,034 | 28 | 10 | 1,052 |

To the Past-Presidents and Council of the Institute I desire to express my hearty appreciation and thanks for their earnest co-operation and unity of purpose, without which the present eminently satisfactory condition in the affairs of the Institute would have been impossible.

## THE NATIONAL IMPORTANCE OF MINING.

The subject of my Presidential adress, a subject of great interest, no doubt, to all members of the Canadian Mining Institute as well as to the general public, is "The National Importance of Mining." The title is by no means new or original, for under this same caption in 1902 one of our Past Presidents, Mr. John E. Hardman, presented a paper which, as he explained, he chose rather than the more specific title of "Government Aid to Mining," for the reason that he wished to emphasize the duty of the nation rather than the duty of the provinces to encourage an industry which has grown to be of such great importance to the Dominion. Mr. Hardman, assuming "that the national importance to which the industry of mining has attained, is axiomatic, proceeds to discuss how the Federal Government can best assist and promote such an industry, not only to greater dimensions, bu also to greater perfection, while still preserving and maintaining fidelity to that branch of the British North America Act by which the control and administration of minerals found within the borders of any particular province was vested in that province." This paper and the discussion following, which was shared by many mining men of prominence in Canada, afforded much necessary information and opinion on this even now timely subject. Our Secretary, Mr. H. Mortimer-Lamb, at this meeting, taking as his text, "State Aid to Mining in Australasia," will present some analogies and conclusions as to governmental assistance to the mining industry.

In this address, however, I do not propose to consider this aspect of the question, but simply to present in facts and inferences regarding the growth and relative importance of mining in Canada, especially in comparison with other industries that depend directly on the exploration and utilization of our natural resources. Minerals, in the widest acceptation of the term, are the basis of the business of mining. They are used either directly or indirectly in every branch of industry, so that it may fairly be said that the measure of a nation's civilization and progress is directly proportionate to the development of its mineral resources, especially those of coal and iron. Cities, towns and even villages, often have their location determined by the presence of some mineral of economic importance; while others, again, owe much of their importance to such proximity. The great centres of industrial activity are directly dependent for their growth on an adequate supply of the raw minerals or mineral products. The might and power of England, as well as the extension of the Empire of Greater Britain to all parts of the habitable globe, are primarily traceable to the occurrence within this tight little island of mineral resources that are unique for their abundance and variety. The rise to eminence and wealth of the United States of America has accompanied the development and utilization of the mineral resources. In addition, each individual State included in the republic owes much of its importance to the possession of minerals whose exploitation has added to the comfort and wealth of its inhabitants. Thus, Alabama has coal and iron; California, gold, quicksilver and petroleum; Indiana, natural gas, building stone and coal; Maine, granite; Michigan, copper and iron; Minnesota, iron; Missouri, lead, zinc and iron; New Jersey, zinc, marble and clays; Ohio, coal, building stone, natural gas and petroleum; Pennsylvania; coal, iron and petroleum; and Tennessee and Vermont, marble.

There are four principal industries based upon the development and utilization of our natural reesources. In the value of their production, agriculture is preeminently first in rank, representing in 1911 a total of $565,711,600. The mineral industry is easily second, with a production in 1910 valued at $106,823,623. In 1910, it was nearly equal in value to the production from the fisheries and forests combined. The value of these two latter in 1910 was $113,954,433. (Forestry $83,989,000; fisheries, $29,965,433).

The relation of the mineral industry to the existing railways also brings out forcibly the importance of mining. This connection is ably illustrated in a paper submitted by Dr. James Douglas to the Institution of Mining and Metallurgy at its nineteen session (1909-1910) entitled "The Influence of the Railroads of the United States and Canada on the Mineral Industry." (Vol. XIX, pp. 2-56). One of the tables quoted shows that the freight supplied to the railways by the mines is far in excess of that contributed by any other branch of national activity. Thus in the United States in 1900, the products of the mine, according to the Interstate Commerce Commission, contributed 52.59 per cent. of the total freight carried by the railways, manufacturers ranking second with 13.41 per cent. In 1906 the products of the mines had increased to 53.09 per cent. of the total freight carried, while manufacturers were again second with 14.81 per cent. In Canada, in 1908, of the total freight hauled by the various railroads in operation, the products of the mines accounted for 35.92 per cent. of the total, while forestry products ranked second in importance, with 20.49 per cent., and agriculture third, with 14.91 per cent.

In order to obtain a true perspective of the national importance of mining to Canada, a brief historical outline seems necessary:

The first recorded mining excitement relating to Canada, was that occasioned by the discovery of some mica reported to contain a considerable proportion of gold, brought back to England by Sir Martin Frobisher in 1576. The great expectations aroused by this find inspired a second and even a third voyage, and the captain was specially directed by commission to search for this gold ore rather than for the discovery of the (Northwest) passage. On the second voyage, in 1577, it is related that they took 200 tons of glittering ore on the southern side of Frobisher's Strait, "but upon tryall made, it proved no better than blacklead and verified the proverb—All is not gold that glistereth." The third voyage, undertaken in 1578, for the purpose of founding a colony and collecting ores, was barren of results.

The limonite or bog iron ore deposits, in the district of Three Rivers, were described as far back as the latter part of the seventeenth century, and in 1737 a blast furnace was erected and smelting operations undertaken which have been carried on more or less continuously to the present time. The existence of workable deposits of copper in the vicinity of the Great Lakes, had long been known, but in 1767 a trader named Henry who had passed the winter at Michipicoten, reported the existence of lead at Maminse and of grey copper ore at that and various other places. In 1770, a company was formed in England, but the narrowing of the vein to 4 inches at a depth of thirty feet, the difficulty of procuring and maintaining mines at so great a distance from any centre of civilization, the remoteness of any market for the ore, as well as the absence of facilities for transportation, rendered these first attempts abortive.

The first mention of the occurrence of coal in Canada, as also in America, is contained in a small book published in Paris in 1672; but mining was not undertaken until 1720, when an opening was made on the north side of Cow Bay, from which coal was obtained for the men working on the fortifications of Louisburg. During the next sixty years the mining of coal was carried on in a desultory fashion, but from 1784 to 1788 the Government itself carried on systematic mining operation on the northwest shore of Sydney Harbour. From 1788 to 1826 these mines were either leased to individuals or worked by the Government, the output varying from 200 to 1,200 tons per year. In 1826 and 1827 the General Mining Association acquired all the ungranted mines and minerals of Cape Breton, and in 1830 the first shaft in the province was sunk on the main seam on the west side of Sydney Harbour.

Douglas, the celebrated botanist, discovered the Blue Bell (silver-lead) mine on Kootenay Lake, British Columbia, in the early twenties. Coal was discovered at Fort Rupert, Vancouver Island, in 1835, and some development work was done by the Hudson Bay Company; but these workings were abandoned in 1851 for those at Nanaimo, where coal mining has ever since been carried on. In 1850 gold was found on Vancouver and Queen Charlotte Islands, and a miniature mining boom took place at the Queen Charlotte Islands in 1851-52. In the interior of British Columbia, gold was found in the Natchey Pass and the Similkameen as early as 1852. In 1852 and 1854, Colville Indians were known to have gold nuggets in their possession, and Chief Trader McLean procured gold dust from Indians near Kamloops in 1852. Between 1855 to 1857 gold discoveries were made on the Thomson, Fraser and Columbia Rivers, and the news soon attracted attention to British Columbia as a possible gold field and first opened it up for settlement.

(To be continued.)

# PRELIMINARY REPORT OF THE MINERAL PRODUCTION OF CANADA, 1912†

Statistics subject to revision.

The total value of the mineral production in Canada in 1912 was $133,127,489 according to the preliminary statistics published herewith, which are based upon direct returns from mine and smelter operators, but subject to final revision. Compared with the previous year this production shows an increase of $29,906,495, or nearly 29 per cent. The mineral output in 1911, however, was somewhat restricted owing to long extended labour disputes and the largest previous production was in 1910 compared with which that of 1912 shows an increase of $26,243,866, or over 24 per cent. The per capita production in 1910 was $14.93, and this has increased in 1912 to over $18. This record is a gratifying indication or confirmation of the fact that the Canadian mineral industry in 1912 has had by far the most successful year in its history.

This progress is all the more satisfactory because it is evidently due to a widespread and substantial development of the country's mineral resources. The only new camp of importance to contribute largely to the year's output was Porcupine, the gold production of which was about one and three-quarter million dollars. A slight scarcity of labour was reported, particularly in connection with the asbestos and clay working industries. There were compartively few clay bour disputes to interfere with output, the principal difficulties being a strike of coal miners on Vancouver Island, beginning in September, and a labour dispute at Porcupine toward the latter part of the year. The total coal and gold production were but slightly affected thereby.

A substantial increase in price in most of the metals, which took place early in the year and continued throughout, had a very important bearing on the year's operations and contributed largely to the increased value of the output.

A feature of particular interest during the year has been the continued and extended development of ore reserves. The satisfactory results from these operations particularly in the case of the nickel-copper ores of the Sudbury district, the Porcupine gold ores of Ontario and a number of the copper and lead deposits of British Columbia, point to much greater annual outputs in the future.

Extension of ore smelting and refining facilities and in a number of cases special improvements in methods of practice have also been important factors in the year's operations.

The production of the more important metals and minerals is shown in the following tabulated statement in which the figures are given for the two years, 1911 and 1912, in comparative form, and the increase or decrease in value shown. Tabulated statements in greater detail, will be found on subsequent pages of this pamphlet:

| | 1911. | | 1912. | | | Increase (+) or decrease (—) in |
|---|---|---|---|---|---|---|
| | Quantity. | Value. | Quantity. | Value. | | value. |
| Copper, lbs. | 55,648,011 | $6,886,998 | $77,775,600 | $12,709,311 | + | $5,822,313 |
| Gold, ozs. | 473,159 | 9,781,077 | 607,609 | 12,559,443 | + | 2,778,366 |
| Pig iron, *tons | 917,535 | 12,307,125 | 1,014,587 | 14,550,999 | + | 2,243,874 |
| Lead, lbs. | 23,784,969 | 827,717 | 35,763,476 | 1,597,554 | + | 769,837 |
| Nickel, lbs | 34,098,744 | 10,229,623 | 44,841,542 | 13,452,463 | + | 3,222,840 |
| Silver, ozs. | 32,559,044 | 17,355,272 | 31,931,710 | 19,425,656 | + | 2,070,384 |
| Other metallic products | ........ | 411,332 | ........ | 982,676 | + | 571,344 |
| Total | | 57,799,144 | | 75,278,102 | + | 17,478,958 |
| Less pig iron credited to imported ores | 875,349 | 11,693,721 | 978 232 | 14,100,113 | + | 2,406,392 |
| Total metallic | | 46,105,423 | | 61,177,989 | + | 15,072,566 |
| Asbestos and asbestic, tons | 127,414 | 2,943,108 | 131,260 | 2,979,384 | + | 36,276 |
| Coal, tons | 11,323,388 | 26,476,646 | 14,699,953 | 36,349,299 | + | 9,881,653 |
| Gypsum, tons | 518,383 | 993,394 | 576,498 | 1,320,883 | + | 327,489 |
| Natural gas | ........ | 1,917,678 | ........ | 2,311,126 | + | 393,448 |
| Petroleum, brls. | 291,092 | 357,073 | 243,336 | 345,050 | — | 12,023 |
| Salt, tons | 91,582 | 443,004 | 95,053 | 459,582 | + | 16,578 |
| Cement, brls. | 5,692,915 | 7,644,537 | 7,120,787 | 9,083,216 | + | 1,438,679 |
| Clay products | ........ | 8,359,933 | ........ | 9,343,321 | + | 983,388 |
| Lime, bush. | 7,533,525 | 1,517,599 | 7,992,234 | 1,717,771 | + | 200,172 |
| Stone | ........ | 4,328,757 | ........ | 4,675,851 | + | 200,172 |
| Miscellaneous non-metallic | ........ | 2,142,842 | ........ | 3,364,017 | + | 1,221,175 |
| Total non-metallic | ........ | 57,115,571 | | 71,949,500 | + | 14,833,929 |
| Grand total | ........ | 103,220,994 | | 133,127,489 | + | 29,906,495 |

†Presented by Mr. John McLeish at Ottawa Meeting.
*Short tons throughout.

The subdivision of the mineral production in 1911 and 1912 by provinces was approximately as follows:

| Province. | 1911. Value of production | 1911. Per cent. of total. | 1912. Value of production. | 1912. Per cent. of total. |
|---|---|---|---|---|
| Nova Scotia | $15,409,397 | 14.93 | $18,843,324 | 14.15 |
| New Brunswick | 612,830 | 0.59 | 806,584 | 0.61 |
| Quebec | 9,304,717 | 9.01 | 11,675,682 | 8.77 |
| Ontario | 42,796,162 | 41.46 | 51,023,134 | 38.33 |
| Manitoba | 1,791,772 | 7.74 | 2,314,922 | 1.74 |
| Saskatchewan | 636,706 | 0.62 | 909,934 | 0.68 |
| Alberta | 6,662,673 | 6.46 | 12,110,960 | 9.10 |
| British Columbia | 21,299,305 | 20.63 | 29,555,323 | 22.20 |
| Northwest Territories | 4,707,432 | 4.56 | 5,887,626 | 4.42 |
| Dominion | $103,220,994 | 100.00 | $133,127,489 | 100.00 |

Of the total production in 1912 a value of $61,177,989 or nearly 46 per cent. is credited to the metals, and $71,949,500 or 54 per cent. to non-metallic products. With the exception of petroleum every important mineral mined in Canada shows an increased production in 1912, in so far as value is concerned. In the case of silver only, is there a decrease in quantity, and this slightly less than 2 per cent., the increase in total value of silver being due to the much higher price obtained for the metal during the year. Among the metals, increases in quantity of output are shown as follows: pig iron, 10.5 per cent.; gold, 10.5 per cent.; gold, 28 per cent.; copper, 40 per cent., and lead, 50 per cent. On account of the generally higher prices of the metals the increases in total value of output considerably exceed the increases in quantity, and are as follows: silver 12 per cent., nickel 31 per cent., copper 85 per cent., and lead 93 per cent.

The most important increases among non-metallic products are in coal, gypsum and cement. Coal shows an increase of 30 per cent. in tonage, gypsum 11 per cent. and cement 26 per cent.

It is a matter of regret to have to report a continued decrease in the production of petroleum. The Canadian output of this product a few years ago was about 50 per cent. of domestic consumption. At the present time not over 5 per cent. of Canada's consumption of petroleum and its products is derived from domestic sources.

The record of production by provinces given above, shows some slight changes in the relative importance of the production of each. The only change in the order of magnitude of output is that Alberta, the production of which had exceeded that of Quebec in 1910, but fallen below again in 1911, on account of its restricted coal output, again takes premier place in 1912. Ontario is still the largest contributor to the total, being credited with 38 per cent., or $51,023,134; British Columbia comes second with 22 per cent., or $29,555,323; Nova Scotia third with $18,843,324, or 14 per cent.; Alberta fourth with $12,110,960, or over 9 per cent., and Quebec fifth with $11,675,682, or a little under 9 per cent.

It should be remembered in dealing with these comparisons that Nova Scotia in the above record is given no credit on account of the large iron smelting and steel making industries at Sydney, New Glasgow, etc. The pig iron made here is entirely from imported ore and naturally is not credited as a Canadian mine output. The same remark applies to a large percentage of the pig iron production in Ontario as well as to the production of aluminium in Quebec.

There was an increased output in each of the provinces in 1912, the largest gains being in Alberta and British Columbia.

In Nova Scotia both coal and gypsum mining were particularly active though a reduced production of gold is reported. Copper and asbestos mining in Quebec contribute chiefly to the increase in that province.

Ontario had important increases in nickel and copper but more especially in gold from the Porcupine district. This province has a large output of non-metallic products including cement, clays, etc. In Alberta coal mining has had a record year exceeding in tonnage the British Columbia production. In the latter province the principal increase was in copper, with gold, silver, lead, zinc, coal and structural or building materials as important contributors.

| | 1907. Cts. | 1908. Cts. | 1909. Cts. | 1910. Cts. | 1911. Cts. | 1912. Cts. |
|---|---|---|---|---|---|---|
| Copper, New York | 20.004 | 13.208 | 12.982 | 12.738 | 12.376 | 16.341 |
| Lead, New York | 5.325 | 4.200 | 4.273 | 4.446 | 4.420 | 4.471 |
| Lead, London | 4.143 | 2.935 | 2.839 | 2.807 | 3.035 | 3.895 |
| Lead, Montreal* | 4.701 | 3.364 | 3.268 | 3.246 | 3.480 | 4.467 |
| Nickel, New York | 45.000 | 43.000 | 40.000 | 40.000 | 40.000 | 40.000 |
| Silver, New York | 65.327 | 52.864 | 51.503 | 53.486 | 53.304 | 60.835 |
| Spelter, New York | 5.962 | 4.720 | 5.503 | 5.520 | 5.758 | 6.943 |
| Tin, New York | 38.166 | 29.465 | 29.725 | 34.123 | 42.281 | 46.096 |

## Smelter Production.

General statistics showing the quantities of ores treated at smelters and the quantities of refined metals or smelter products obtained have been collected by this branch since 1908. It should be explained that the accompanying statistics include the treatment of a small quantity of imported ores chiefly in the British Columbia smelters.

The total quantity of ores, concentrates, etc., treated in 1912, was 3,008,559 tons as compared with 2,193,553 tons in 1911.

The ores treated may be conveniently classified as follows:

*Quotations furnished by Messrs. Thomas Robertson & Company, Montreal, Que.

| | 1910. Tons. | 1911. Tons. | 1912. Tons. |
|---|---|---|---|
| Nickel copper ores | 628,947 | 610,834 | 725,065 |
| Silver-cobalt nickel-arsenic ores | 9,466 | 9,330 | 8,136 |
| Lead and other ores treated in lead furnaces | 57,549 | 55,408 | 63,042 |
| Copper-gold-silver ores | 1,987,752 | 1,517,981 | 2,212,316 |
| Total | 2,683,714 | 2,193,553 | 3,008,559 |

The products obtained in Canada from the treatment of these ores include: refined lead produced at Trail, B.C., and fine gold, fine silver, copper sulphate, and antimony produced from the residues of the lead refinery; silver bullion, white arsenic, nickel oxide, and cobalt oxide produced in Ontario, from the Cobalt District ores. In addition to these refined products, blister copper, copper matte, nickel-copper matte, cobalt material or mixed nickel and cobalt oxides are produced and exported for refining outside of Canada.

The aggregate results of smelting and refining operations may be summarized as shown in the next table. Unfortunately the figures cannot be taken to represent the total production from smelting ores mined in Canada, since considerable quantities of copper and silver ores are still shipped to other smelters outside of Canada for smelting.

| | 1911. Refined products. | 1911. Metals contained in matte blister, base bullion and speiss. | 1912. Refined products. | 1912. Metals contained in matte blister, base bullion and speiss. |
|---|---|---|---|---|
| Gold, ozs. | 15,270 | 175,189 | 12,118 | 184,815 |
| Silver, ozs. | 19,078,768 | 585,896 | 17,877,914 | 686,171 |
| Lead, lbs. | 23,525,050 | ...... | 35,893,190 | ...... |
| Copper, lbs. | ...... | 29,855,868 | ...... | 58,405,910 |
| Copper sulphate | 197,187 | ...... | 87,110 | ...... |
| Nickel | ...... | 34,098,744 | ...... | 44,841,542 |
| *Nickel and cobalt oxides | 1,415,006 | ...... | 1,634,087 | ...... |
| White arsenic | 4,194,209 | ...... | 4,090,756 | ...... |

Smelter products shipped outside of Canada for refining were: blister copper carrying gold and silver values 17,069 tons in 1912, as compared with 10,710 tons in 1911; copper matte carrying gold and silver values 6,727 tons in 1912, as against 11,320 tons in 1911; Bessemer nickel-copper matte carrying small gold and silver value as well as metals of the platinum group 41,925 tons in 1912, as compared with 32,607 tons in 1911.

## Gold.

The gold production of 1912 is estimated at approximately $12,559,443, which compared with the 1911 production $9,871,077 shows an increase of $2,778,366.

The Yukon placer production in 1912 is estimated at $5,540,000, as against $4,580,000 in 1911, the total exports on which royalty was paid during the calendar year, according to the records of the Department of Interior, being 335,015.67 ounces in 1912 and 277,430.97 ounces in 1911. The British Columbia production in 1912 was $5,167,390, of which the placer production, as estimated by the Provincial Mineralogist, was $500,000, smelter recoveries and bullion obtained from milling ores being valued at $4,667,390. The main feature of the year was the large increase from Ontario due to the commencement of operations by several mills in the Porcupine district, the province producing $1,745,292 as against $42,625 in 1911.

In Quebec there is a small amount credited to the pyritic ores as well as a small recovery from Beauce county an dthe Nova Scotia estimate shows a further decrease.

The exports of gold-bearing dust, nuggets, gold in ore, etc., in 1912, were valued at $10,014,654.

Gold in bars, blocks, ingots, etc., was imported in 1912 to the value of $1,096,546.

## Silver.

In quantity there was a slight decrease in the silver production in 1912, returns to date showing a production of 31,931,710 fine ounces, an apparent falling off of 627,334 ounces, but due to the increased price, the value shows an increase from $17,355,272 in 1911 to $19,425,656 in 1912 or $2,079,384.

Of the 1912 production 29,190,122 ounces were from Ontario, 2,651,118 from British Columbia, the increases being from British Columbia and the Yukon.

For British Columbia the figures represent the recovery as millbullion or silver contained in smelter products, while for Ontario the figures represent the total silver content of ore and concentrates shipped, less five per cent. allowed for smelter losses, together with bullion shipments.

The total shipments of ore and concentrates from the Cobalt district and adjacent mines were about 29,116 tons, containing approximately 25,684,082 ounces, in addition to which 4,773,878 ounces were shipped as bullion.

There was also a small silver recovery from the gold ores of Ontario.

In Quebec the silver was derived from the pyritic ores of the eastern townships.

The exports of silver in ore, etc., as reported by the Customs Department were 34,911,922 ounces, valued at $19,494,416. There was also an importation of silver in bars, blocks, sheets, etc., valued at $822,020.

*Nickel oxide, cobalt oxide and cobalt material, etc., not all completely refined.

The price of silver in New York varied between a minimum of 54¾ cents per ounce in January and a maximum of 64⅛ cents in October, the average monthly price being 60.835 cents, compared with an average of 53.304 cents in 1911.

### Copper.

There is practically no recovery of refined copper in Canada and the production is represented by the copper contents of smelter of smelter products, matte, blister-copper, etc., together with the amount of copper contained in ores exported, estimated as recoverable.

The total production on this basis in 1912 was 77,775,600 pounds, valued at $12,709,311, as compared with 55,648,011 pounds valued at $6,886,998 in 1911, an increase in quantity of 22,127,589 pounds and in value of $5,822,313.

Quebec province is credited with a production of 3,225,523 pounds as against 2,436,190 pounds in 1911, the increase being due to the increased production from the pyritic ores of the Eastern Townships. Ontario's production in 1912 was 22,250,601 pounds, as compared with 17,932,263 pounds in 1911, being mainly derived from the nickel-copper ores of the Sudbury district.

Apart from the copper shipments from Dane, the most interesting occurrence was the payment made for copper in shipments from the Cobalt camp.

British Columbia had a record output of 50,526,816 pounds, having had a year of uninterrupted smelter operation free from strikes and other disturbances.

From the Yukon the Pueblo mine was a heavy shipper.

The New York price of electrolytic copper varied during the year between 13.75 cents per pound in February, to 17.60 in August, the average for the year being 16.341 cents, as against an averaeg monthly price of 12.376 cents in 1911.

The exports of copper in 1912 were: copper, fine in ore, etc., 76,542,643 pounds, valued at $8,800,276, and copper black or coarse and in pigs, 1,945,921 ponnds, valued at $236,212.

The total imports of copper in 1912 were valued at $7,052,534.

### Lead.

The total production of lead in 1912 was 35,763,476 pounds, valued at $1,597,554, or an average of 4.467 cents per pound, the average wholesale or producers price of pig lead in oMntreal for the year. In 1911 the production was 23,784,969 pounds, valued at $827,717.

The shipments were practically all from British Columbia mines in 1912, a small shipment being made from Ontario mines, but not paid for. Towards the close of the year the North American smelter at Kingston, Ontario, started operations.

In British Columbia the resumption of active operations at the Blue Bell and the activity of the Consolidated Mining and Smelting Company and a number of the more imprtant purely mining companies have been factors in the increase.

The exports of lead in ore, etc., in 1912 are reported as 299,240 pounds, valued at $8,193. No pig lead was exported.

The total value of the imports of lead and lead products in 1912 was $1,806,221, including pig lead, bars, sheets, tea lead, etc., valued at $1,202,001; manufactures of lea dvalued at $200,157; litharge and lead pigments, valued at $404,063.

The total value of the imports of lead and lead products in 1911 was $1,049,276, being pig lead, etc., $706,020; manufactures, $108,012, and litharge and lead pigments, $235,244.

The average monthly price of lead in Montreal during 1912 was 4.467 cents per pound. This is the producers price for lead in car lots as per quotations kindly furnished by Messrs. Thos. Robertson & Co.

The average monthly price of lead in New York during the year was 4.471 cents, and in London £18.929 per long ton, equivalent to 3.895 cents per pound.

The amount of bounty paid during the twelve months ending December 31, 1912, on account of lead production, was $118,425.74, as compared with $219,557.70 in 1911.

### Nickel.

The mining and smelting of nickel-copper ores in the Sudbury District of Ontario, was carried on with greatly increased output during 1912. The same companies were in operation as in previous years, viz.: The Mond Nickel Company and the Canadian Copper Company operating mines and smelters, and the Dominion Nickel Company, developing and proving ore bodies. It is interesting to note that small shipments of nickel ore were also made from the Alexo Mine at Kelso, in the Nipissing district. This ore was smelted at Victoria Mines.

Considerable changes have been made in some of the details of smelting practice, although the general method remains the same, i.e., the ore is roasted, smelted and converted to a Bessemer matte containing from 77 to 82 per cent. of combined metals, copper and nickel, the matte being shipped to the United States and Great Britain for refining. A portion of the matte made by the Canadian Copper Company is used for the direct production of monel metal, an alloy of nickel and copper, without the intermediate refining of either metal.

The total production of matte in 1912 was 41,925 tons, valued by the producers, at the smelters at $6,303,102, an increase of 9,318 tons, or nearly 20 per cent. over the production of 1911. The metallic contents were copper 22,231,725 pounds, and nickel 44,841,542 pounds. The amount of ore smelted was 725,065 tons, which included 1,720 tons from the Alexo mine mentioned above.

The aggregate results of the operations on the nickel ores during the past four years were as follows in tons of 2,000 pounds:

| | 1909. Tons. | 1910. Tons. | 1911. Tons. | 1912. Tons. |
|---|---|---|---|---|
| Ore mined | 451,892 | 652,392 | 612,511 | 737,584 |
| Ore smelted | 462,336 | 628,947 | 610,834 | 725,065 |
| Bessemer matte produced | 25,845 | 35,033 | 32,607 | 41,925 |
| Copper content of matte | 7,873 | 9,630 | 8,966 | 11,116 |
| Nickel content of matte | 13,141 | 18,636 | 17,049 | 22,421 |
| Spot value of matte | $3,913,017 | $5,380,064 | $4,945,592 | $6,303,102 |

| | Lbs. | Lbs. | Lbs. | Lbs. |
|---|---|---|---|---|
| Nickel contained in matte, etc.: | | | | |
| Exported to Great Britain | 3,843,763 | 5,335,331 | 5,023,393 | 5,072,867 |
| Exported to United States | 21,772,635 | 30,679,451 | 27,596,578 | 39,148,993 |
| | 25,616,398 | 36,014,782 | 32,619,971 | 44,221,860 |

The price of refined nickel in New York remained practically constant throughout the year, quotations in the Engineering and Mining Journal being for large lots, contract business, 40 to 45 cents per pound except during the early part of May, when 40 to 50 cents was quoted. Retail spot from 50 cents for 500 pound lots up to 55 cents for 200 pound lots. The price for electrolytic is 5 cents higher.

## Iron.

**Iron Ore.**—Complete returns of iron ore production have not yet been received but shipments from Canadian mines in 1912 were probably about 175,000 tons.

The total shipments of iron ore from mines in 1911 were 210,344 short tons, valued at $522,319, and included 137,399 tons classed as rhematite and 72,945 tons as magnetite.

Exports of iron ore from Canada during 1912 were recorded by the Customs Department as 118,129 tons, valued at $382,005. The exports were chiefly from Bathurst, New Brunswick, and Torbrook, Nova Scotia.

Shipments from the Wabana Mines, Newfoundland, in 1912, by the two Canadian companies operating there, were 1,331,912 short tons, of which 956,459 tons were shipped to Sydney and 375,453 tons to the United States and Europe.

**Pig Iron.**—The total production of pig iron in Canadian blast furnaces in 1912 was 1,014,587 tons of 2,000 pounds, valued at approximately $14,550,999, as compared with 917,535 tons, valued at $12,307,125 in 1911.

Of the total output in 1912, 21,701 tons were made with charcoal as fuel and 92,886 tons with coke. The classification of the production according to the purpose for which it was intended was as follows: Bessemer, 256,191 tons; basic, 544,534 tons; foundry and miscellaneous, 213,862 tons.

The amount of Canadian ore used during 1912 was 71,588 tons; imported ore 2,019,165 tons; mill cinder, etc., 36,901 tons. The amount of coke used during the year was 1,265,998 tons, comprising 609,183 tons from Canadian coal and 658,815 tons imported coke or coke made from imported coal. There were also used 1,886,748 bushels of charcoal. Limestone flux was used to the extent of 705,613 tons.

In connection with blast furnace operations there were employed 1,358 men and $993,941 were paid in wages.

The production of pig iron by provinces in 1911 and 1912 was as follows:

| | 1911. | | | 1912. | | |
|---|---|---|---|---|---|---|
| | Tons. | Value. | Value. per ton. | Tons. | Value. | Value. per ton. |
| Nova Scotia | 390,242 | $4,682,904 | $12.00 | 424,994 | $6,374,910 | $15.00 |
| Quebec | 658 | 17,282 | 26.24 | ...... | ...... | ...... |
| Ontario | 526,635 | 7,606,939 | 14.44 | 589,593 | 8,176,089 | 13.87 |
| | 917,535 | $12,307,125 | 13.41 | $1,014,587 | $14,550,999 | 14.34 |

*The Nova Scotia producers do not place a selling value upon their pig iron production and the increased value used for Nova Scotia pig iron in 1912 does not mean that there has been an increase in the value as shown but that the value used in 1911 was probably too low.

There was also a production during 1912 in electric furnaces of 7,834 tons of ferro-alloys valued at $465,225, as compared with 7,507 tons valued at $376,404 in 1911.

The exports of pig iron during the year are reported as 6,976 tons, valued at $310,702, an average of $44.53 per ton. Probably the greater part of this is ferro-silicon and ferro-phosphorus produced respectively at Welland and Buckingham.

There were imported during the year 272,680 tons of pig iron, valued at $3,512,969, and 19,810 tons of ferro-manganese, etc., valued at $469,884.

## Asbestos.

The total shipments of asbestos in 1912 exceeded those of 1911 by at least 5 per cent., it being probable that complete returns will show a somewhat higher production and shipments than the figures given below. According to returns so far received, the total output of asbestos was 97,816 tons, the sales 106,520 tons, valued at $2,959,677, or an average of $27.79 and stock on hand at the end of the year amounting to 21,686 tons, valued at $1,021,066. The record indicates an increase in sales and a reduction of stocks on hand.

Shipments were confined to the mines of the Black Lake and Thetford districts, those at East Broughton remaining idle. Operators report that they were handicapped by shortage of labour, but since market prices and conditions have greatly improved, 1913 promises to be a very successful year.

The number of men employed in mines and mills during 1912, was 2,755, at a wage cost of $1,296,655.

The total quantity of asbestos rock sent to mills is reported as 1,514,314 tons, which, with a mill production of 97,815 tons, shows an average estimated recovery of about 6.45 per cent.

The following tabulated statement shows the output and sales during 1912, and the stock on hand at the end of the year.

| | Output. Tons. | Tons. | Sales. Value. | Per ton. | Stock on hand Dec. 31. Tons. | Value. | Per ton. |
|---|---|---|---|---|---|---|---|
| Crude No. 1 | 1,447¾ | 1,928.9 | $507,904 | $263.31 | 864.8 | $220.789 | $255.31 |
| Crude No. 2 | 3,224 | 3,669 | 372,357 | 101.49 | 2,719 | 293,263 | 107.86 |
| Mill stock No. 1 | 19,672 | 18,758 | 843,559 | 44.97 | 7,490 | 338,069 | 45.13 |
| Mill stock No. 2 | 35,389 | 43,359 | 855,902 | 19.74 | 6,278 | 132,349 | 21.08 |
| Mill stock No. 3 | 38,083 | 38,805 | 379,955 | 9.79 | 4,334 | 36,596 | 8.44 |
| Total asbestos | 97,815¾ | 106,519.9 | $2,959,677 | $27.79 | 21,685.8 | $1,021,066 | $47.08 |
| Asbestic | ...... | 24,740 | 19,707 | 0.80 | ...... | ........ | ...... |

In the absence of a uniform classification of asbestos of different grades the above subdivisions have been adopted purely on a valuation basis; crude No. 1 comprising material valued at $200 and upwards, and crude No. 2 under $200; mill stock No. 1 includes stock valued at from $30 to $100; No. 2 from $15 to $30; No. 3 under $15.

Output, sales and stocks in 1911 were as follows:

| | Output. Tons. | Tons. | Sales. Value. | Per ton. | Stock on hand Dec. 31. Tons. | Value. | Per ton. |
|---|---|---|---|---|---|---|---|
| Crude No. 1 | 1,467.9 | 1,301.4 | $342,855 | $263.45 | 1,256 | $327,508 | $260.75 |
| Crude No. 2 | 3,594.5 | 3,562.7 | 402,107 | 112.87 | 3,222.7 | 404,198 | 125.42 |
| Mill stock No. 1 | 20,379 | 18,315 | 916,678 | 50.05 | 8,471 | 380,570 | 44.93 |
| Mill stock No. 2 | 39,289 | 47,826 | 991,370 | 20.73 | 17,794 | 365,458 | 20.54 |
| Mill stock No. 3 | 31,572 | 30,388 | 269,052 | 8.85 | 3,823 | 31,367 | 8.20 |
| Total asbestos | 96,302.4 | 101,393.1 | $2,922,062 | 28.82 | 34,566.7 | $1,509,101 | $43.66 |
| Asbestic | ...... | 26,021 | 21,046 | 0.81 | | | |

Exports of asbestos during the twelve months ending December 31, 1912, are reported as 88,008 tons, valued at $2,349,353, as against 75,120 tons, valued at $2,067,259 exported in 1911.

### Coal and Coke.

With the exception of a partial interruption of work, on Vancouver Island during the last three months of the year due to a dispute of coal miners, coal mining was actively prosecuted in all important coal mining districts during 1912. Thus in contrast with 1911 when the output was seriously reduced by a long continued strike in Southern Alberta and British Columbia the production in 1912 shows a very large increase.

The total production of coal during the past year comprising sales and shipments, colliery consumption, and coal used in making coke, etc., was 14,699,953 short tons, valued at $36,349,299, as against 11,323,388 tons, valued at $26,467,646 in 1911, and 12,909,152 tons valued at $30,909,779 in 1910. The 1912 production exceeded all former outputs. Nova Scotia shows an increase of nearly 8 per cent., British Columbia an increase of over 26 per cent., though not quite up to the 1910 production. Alberta an increase of about 128 per cent. over 1911, and 19 per cent. over 1910. The other provinces show comparatively little change. The figures for the Yukon represent the production from the Tantalus field, no record having been received of the output below Dawson.

The production by provinces during the past three years is given below:

| Province. | 1910. Tons. | Value. | 1911. Tons. | Value. | 1912. Tons. | Value. |
|---|---|---|---|---|---|---|
| Nova Scotia | 6,431,142 | $12,919,705 | 7,004,420 | $14,071,379 | 7,791,440 | $17,391,608 |
| British Columbia | 3,330,745 | 10,408,580 | 2,542,532 | 7,945,413 | 3,220,899 | 10,065,311 |
| Alberta | 2,894,469 | 7,065,736 | 1,511,036 | 3,979,264 | *3,446,349 | 8,471,126 |
| Saskatchewan | 181,156 | 293,923 | 206,779 | 347,248 | 196,325 | 327,054 |
| New Brunswick | 55,455 | 110,910 | 55,781 | 111,562 | 42,780 | 85,560 |
| Qukon Territory | 16,185 | 110,925 | 2,840 | 12,780 | 2,160 | 8,640 |
| Total | 12,909,152 | $30,909,779 | 11,323,388 | $26,467,646 | 14,699,953 | $36,349,299 |

The exports of coal in 1912 were 2,127,133 tons, valued at $5,821,593, as compared with exports of 1,500,639 tons, valued at $4,357,074 in 1911, an increase in exports of 626,494 tons.

Imports of coal during the year included bituminous, round and run of mine 8,491,840 tons, valued at $16,846,727; bituminous slack 1,919,953 tons, valued at $2,550,922, and anthracite 4,184,017 tons, valued at $20,080,388, or a total of 14,595,810 tons, valued at $39,478,037.

The imports in 1911 were bituminous, run of mine, 8,905,815 tons; bituminous slack 1,632,500 tons, and anthracite 4,184,017 tons, valued at $20,080,388, or a total of 14,595,810 tons, valued at $39,478,037.

*Statistics furnished by Mr. John Stirling, Inspector of Mines, Alberta.

The imports in 1911 were bituminous, run of mine, 8,905,815 tons; bituminous slack 1,632,500 tons, and anthracite 4,020,577 tons, or a total of 14,558,892 tons.

The apparent consumption of coal in 1912 was thus 27,168,630 tons, as against an apparent consumption in 1911 of 24,381,641 tons.

**Coke.**—The total production of oven coke in 1912 was 1,411,219 tons, valued at $5,352,520, as compared with a production of 935,651 tons, valued at $3,630,410 in 1911. A considerable percentage of this is made from imported coal.

By provinces the production in 1912 was: Nova Scotia 625,908 tons, Ontario 379,854 tons, Alberta 105,684 tons, and British Columbia 299,773 tons, as against a production in 1911 of: Nova Scotia 557,554 tons, Ontario 259,554 tons, Alberta 36,216 tons, and British Columbia 82,327 tons.

The quantity of coke imported during the calendar year 1912 was 628,174 tons, valued at $1,702,856, as compared with imports of 751,389 tons, valued at $1,843,248 in 1911.

### Petroleum and Natural Gas.

The annual output of crude petroleum from Canadian oil wells still continues to decline, the production having steadily fallen off during the past five years. Twelve years ago Canada produced about 50 per cent. of the domestic consumption of petroleum and its products, while at the present time not over 5 per cent. of our consumption is derived from Canadian oil wells. The output in 1912 was 243,336 barrels or 8,516,762 gallons, valued at $345,050, compared with 291,092 barrels or 10,188,219 gallons, valued at $357,073 in 1911. The average price per barrel at Petrolea in 1912 was $141.08 or considerably higher than the average price in 1911, which was $122 2-3.

The price of crude oil increased steadily through the year, rising from a minimum of $1.24 in January to a maximum of $1.65 in the latter part of December.

These statistics of production have been furnished by the Department of Trade and Commerce and represent the quantities of oil on which bounty was paid, the total bounty payments being $127,751.39 in 1912 and $152,823.29 in 1911.

The production in Ontario by districts as furnished by the supervisor of petroleum bounties, was in 1912, as follows, in barrels: Lambton, 150,272; Tilbury and Romney, 44,727; Bothwell, 34,486; Dutton, 4,335, and Onondago, 7,115; or a total of 240,935 barrels. This agrees very closely indeed with the production in Ontario on which bounty was paid, viz., 240,657 barrels. In 1911, the production by districts was: Lambton, 184,450; Tilbury and Romney, 48,708; Bothwell, 35,244; Dutton, 6,732; and Onondago, 13,501.

The production in New Brunswick in 1912 was 2,679 barrels, as against 2,461 barrels in 1911, and 1,485 barrels in 1910.

Exports entered as crude mineral oil in 1912 were 18,500 gallons valued at $3,964, and oil refined 36,945 gallons valued at $6,147. There was also an export of naptha and gasoline of 25,791 gallons, valued at $4,261.

The decreased production has been accompanied, particularly during the past two or three years, by a very large increase in imports of petroleum and petroleum products. The total imports of petroleum oils crude and refined in 1912 was 186,787,484 gallons, valued at $11,848,533, in addition to 2,144,006 pounds of wax and candles valued at $119,520. The oil imports included crude oil 120,082,405 gallons, valued at $3,996,842; refined illuminating oils, 14,748,218 gallons, valued at $1,022,735; gasoline, 40,904,598 gallons, valued at $5,347,767; lubricating oils, 6,763,800 gallons, valued at $1,077,712, and other petroleum products 4,288,463 gallons, valued at $413,477.

The total imports in 1911 were 116,892,689 gallons of petroleum oils crude and refined, valued at $6,009,730, and 1,959,787 pounds of wax and candles, valued at $106,424. The oil imports comprised crude oil, 71,653,251 gallons, valued at $2,188,870; refined and illuminating oils, 13,690,962 gallons, valued at $722,403; gasoline, 23,338,773 gallons, valued at $1,976,032; lubricating oils, 5,308,917 gallons, valued at $806,452, and other petroleum products, 2,900,786 gallons, valued at $315,973.

The principal increases in imports have been in crude oil now used so extensively in British Columbia by the railways and in gasoline.

**Natural Gas.**—While the production of petroleum has been declining, the output and use of natural gas has been steadily increasing. The southern portion of Ontario has for many years been the principal source of gas, but the Albert county field in New Brunswick is now an important producer while large developments are taking place in Alberta with such a rapid increase in output of gas that this province may soon take first place as a producer.

The total production in Canada in 1912 was approximately 15,015 million feet, valued at $2,311,126, and includes 12,534 million in Ontario, valued at $2,045,488 and 2,481 million feet in Alberta, value at $265,638. New Brunswick returns have not yet been received. The production in 1911 was reported as 11,644 million feet, valued at $1,907,678, including 10,864 million feet in Ontario, valued at $1,807,513 and 780 million feet in Alberta, valued at $110,165. These values represent as closely as can be ascertained the value received by the owners or operators of the wells for gas produced and sold or used. The values do not represent what consumers have to pay since in many cases the gas is resold once or twice by pipe line companies before reaching the consumer.

### Cement.

The statistics of production of cement given herewith, will be subject to but slight variation when complete returns shall have been received. Estimates have had to be made for two firms that had not yet reported but the totals given are probably with a half of one per cent. of the final returns. The record for the past year is of particular interest, in view of the undoubted widespread demand for cement. Congestion of freight traffic no doubt militated somewhat against the eastern mills supplying western requirements and in order to relieve the situation the Federal Government reduced the duty one-half on importations during the period from June 12 to October 31, inclusive. Statistically the important features of the industry during the year were an increase of over 26 per cent. in the Canadian output, an increase of over 116 per cent. in imports and an increase of over 34 per cent. in total consumption. Canadian mills supplied 83.2 per cent. of the consumption as against 90 per cent. in 1911.

The total quantity of Portland cement, including slag cement and natural Portland, made in 1912, was 7,169,184 barrels. The quantity of Canadian cement sold or used was 7,120,787 barrels, valued at the mills at $9,083,216, or an average of $1.27½ per barrel. The total imports of cement were 5,020,446 cwt. equivalent to 1,434,413 barrels of 350 pounds each, and valued at $1,969,529, or an average of $1.37 per barrel. The total consumption of Portland cement, therefore, neglecting a small export of Canadian cement, was approximately 8,555,200 barrels.

Detailed statistics of production during the past four years are shown as follows:

| | 1909. Brls. | 1910 Brls. | 1911. Brls. | 1912. Brls. |
|---|---|---|---|---|
| Portland cement sold | 4,067,709 | 4,753,975 | 5,692,915 | 7,120,787 |
| Portland cement manufactured | 4,146,708 | 4,396,282 | 5,677,539 | 7,169,184 |
| Stock on hand Jan. 1st. | 1,098,239 | 1,189,731 | 918,965 | 904,165 |
| Stock on hand Dec. 31 | 1,177,238 | 832,038 | 903,589 | 952,562 |
| Value of cement sold | $5,345,802 | $6,412,215 | $7,644,537 | $9,083,216 |
| Wages paid | 1,266,128 | 1,409,715 | 2,103,838 | 2,591,090 |
| Men employed | 2,498 | 2,220 | 3,010 | 3,379 |

The average price per barrel at the works in 1912 was $1.27½, as compared with $1.34 in both 1911 and 1910.

The imports of cement already included 130,580 barrels from Great Britain, 1,280,958 barrels from the United States, 6,107 barrels from Belguim, 15,857 barrels from Hong Kong, and 911 barrels from other countries.

The average price per barrel was $1.37, as against an average value of $1.26 on imports in 1911, in which year the total imports were 661,916 barrels valued at $834,879. These included 190,506 barrels from the United Kingdom, 441,317 barrels from the United States, and 30,093 barrels from other countries.

The consumption of Portland cement in Canada during each of the past five years is shown as follows:

**Annual Consumption of Portland Cement.**

| Calendar Year. | Canadian. Brls. | % | Imported. Brls. | % | Total. Brls. |
|---|---|---|---|---|---|
| 1908 | 2,665,289 | 85 | 469,049 | 15 | 3,134,388 |
| 1909 | 4,067,709 | 97 | 142,194 | 3 | 4,209,903 |
| 1910 | 4,753,975 | 93 | 349,310 | 7 | 5,103,285 |
| 1911 | 5,692,915 | 90 | 661,916 | 10 | 6,354,831 |
| 1912 | 7,120,787 | 83.2 | 1,434,413 | 16.8 | 8,555,200 |

**Annual Mineral Production in Canada Since 1886.**

| Year. | Value of production. | Value per capita. | Year. | Value of production. | Value per capita. |
|---|---|---|---|---|---|
| 1886 | $10,221,255 | $2.23 | 1900 | 64,420,877 | 12.04 |
| 1887 | 10,321,331 | 2.23 | 1901 | 65,797,911 | 12.16 |
| 1888 | 12,518,894 | 2.67 | 1902 | 63,231,836 | 11.36 |
| 1889 | 14,013,113 | 2.96 | 1903 | 61,740,513 | 10.83 |
| 1890 | 16,763,353 | 3.50 | 1904 | 60,082,771 | 10.27 |
| 1891 | 18,976,616 | 3.92 | 1905 | 69,078,999 | 11.49 |
| 1892 | 16,623,415 | 3.39 | 1906 | 79,286,697 | 12.81 |
| 1893 | 20,035,082 | 4.04 | 1907 | 86,865,202 | 13.75 |
| 1894 | 19,931,158 | 3.98 | 1908 | 85,557,101 | 13.16 |
| 1895 | 20,505,917 | 4.05 | 1909 | 91,831,441 | 13.70 |
| 1896 | 22,474,256 | 4.38 | 1910 | 106,823,623 | 14.93 |
| 1897 | 28,485,023 | 5.49 | 1911 | 103,220,994 | 14.42 |
| 1898 | 38,412,431 | 7.32 | 1912 | 133,127,489 | 18.01 |
| 1899 | $49,234,005 | $9.27 | | | |

# ADVANCE STATEMENT OF MINERAL PRODUCTION, PROVINCE OF QUEBEC*

(Figures are subject to revision)

Although there are still a few producers who are dilatory in sending in their returns of production, on the whole the responses to our enquiries are prompt and the following figures give a close approximation of the mineral production of the Province of Quebec during the year 1912.

The present statement wil be followed, in the course of a few weeks, by the complete annual report, giving corrected figures and more detailed information concerning the mining industry of the Province during 1912, as well as the report of the field-parties sent out by the Mines Branch during the summer of 1912.

In the following table, giving the value of the mineral production for 1912, a column has been added giving the value of the same products during the previous year 1911.

*From pamphlet presented by Theo. C. Denis, Ottawa Meeting, 1913.

**Table of Mineral Production of the Province of Quebec During 1912.**

| Substances. | Production 1912 Quantities | Production 1912 Value | Value in 1911 |
|---|---|---|---|
| Asbestos, tons | 111,175 | $3,059,084 | $3,026,306 |
| Asbestic, tons | 25,471 | 23,358 | 19,802 |
| Copper and sulphur ore | 62,107 | 631,963 | 240,097 |
| Gold, ozs. | 980 | 19,924 | 11,800 |
| Silver, ozs. | 26,526 | 14,591 | 11,500 |
| Bog Iron Ore, tons | ...... | ...... | 4,041 |
| Ochre, tons | 7,054 | 32,010 | 28,174 |
| Chromite, tons | ...... | ...... | 2,469 |
| Mica, tons | ...... | 99,463 | 76,428 |
| Phosphate, tons | 164 | 1,640 | 5,832 |
| Graphite, lbs. | 1,210,278 | 50,680 | 33,613 |
| Mineral Water, gals. | 39,452 | 9,854 | 65,648 |
| Titaniferous Ores, tons. | 2,949 | 4,935 | 5,684 |

| | | | |
|---|---|---|---|
| Slates, squares ....... | 1,894 | 8,939 | 8,248 |
| Cement, bbls. ........ | 2,684,002 | 3,098,350 | 1,931,183 |
| Magnesite, tons ...... | 1,714 | 9,645 | 6,416 |
| Marble ............... | ...... | 250,939 | 143,457 |
| Flagstone............ | ...... | 600 | 500 |
| Gold, ozs............. | 980 | 19,924 | 11,800 |
| Lime, bush. .......... | 1,705,937 | 455,570 | 284,334 |
| Limestone............ | ...... | 1,361,082 | 1,128,402 |
| Bricks, M. ........... | 100,146 | 1,284,232 | 1,129,480 |
| Tiles, Drain & Sewer Pipe, Pottery, etc. .. | ...... | 203,100 | 142,223 |
| Kaolin, tons ......... | 40 | 520 | |
| Feldspar ,tons ....... | 110 | 2,200 | 600 |
| Peat, tons ........... | 500 | 2,000 | 700 |
| Glass Sand .......... | 152 | 418 | 1,179 |
| Sand ................ | 81,800 | 33,200 | 62,000 |
| Quartz............... | ...... | ...... | 1,125 |
| | | $11,017,046 | $8,679,786 |

We have therefore to record an increase of $2,337,260 in 1912 as compared with 1911. For the last ten years, the record of increases of each year over the previous one has been unbroken as the following table shows.

### Table Showing the Annual Value of the Mineral Production of the Province of Quebec Since 1903.

| Year. | Value. |
|---|---|
| 1903........................... | $2,772,762 |
| 1904........................... | 3,023,568 |
| 1905........................... | 3,750,300 |
| 1906........................... | 5,019,932 |
| 1907........................... | 5,391,368 |
| 1908........................... | 5,458,998 |
| 1909........................... | 5,552,062 |
| 1910........................... | 7,323,281 |
| 1911........................... | 8,679,786 |
| 1912........................... | 11,017,046 |

### Notes on Mineral Production in 1912.

#### Asbestos.

Asbestos, as in the past years, heads the list of the products of the Quebec mines in 1912. After having passed through a severe crisis, the asbestos market is steadily improving. This is specially true for the higher grades, crude and long fiber mill-stock. The demand for the short mill-stock is not brisk, and, as a consequence, the qualities under $30 a ton have to be sacrificed to some extent.

Therefore, under these circumstances, of good prices for high grade stock and low prices for short mill-stock it is quite easy to understand that only the mines which can produce the better qualities are able to operate satisfactorily. Hence, none of the mines of the Broughton district were operated during 1912, as the Broughton rock is essentially a milling rock, containing as a rule a good percentage of disseminated fiber, but short and low in value. The same remark applies to most of the mines of the Robertson district.

On the other hand, the Thetford mines and the Black Lake mines worked steadily and the shipments are higher than for 1911.

Figures of comparisons between the last three years are given below:

#### Shipments of Asbestos.

| | 1912. | 1911. | 1910. |
|---|---|---|---|
| Tons........... | 111,175 | 102,224 | 80,605 |
| Value........... | $3,059,084 | $3,026,306 | $2,667,829 |
| Aver value per ton | 27.52 | $29.60 | $33.10 |

#### Stock on Hand on Dec. 31st.

| | 1912. | 1911. | 1910. |
|---|---|---|---|
| Tons............ | 24,176 | 33,751 | 41,159 |
| Value.......... | $1,102,206 | $1,583,076 | $1,921,923 |

Returns of shipments in 1912 were received from nine operators, whereas in 1911, shipments had been effected by ten operators.

If we compare the figures for 1912 with those of 1911 we see that the shipments increased 8.75%, while the total value shows an increase of only 1.07%.

#### Copper and Sulphur Ores.

The increase in the price of copper which prevailed during 1912 as compared with 1911 naturally caused a renewal of activity in the copper mines of the Eastern townships. This was manifested by a marked increase in the shipments of copper and sulphur ore, which this year amounted to 62,107 tons, valued at $631,963 for their copper and sulphur contents; as compared with 38,554 tons, valued at $240,097 in 1911.

The McDonald mine at Weedon which is operated by the East Canada Smelting Co. is responsible for a large part of the increase. This mine is operating very satisfactorily.

The Eustis mine, another mine of cupriferous pyrite which has been in operation for 30 years, was another active shipper.

**Iron.**—For the first time in a great many years, there were no blast furnace operations in the Province of Quebec. Both the Drummondville and the Radnor furnaces remained idle all year.

**Gold and Silver.**—The gold production of the Province amounted to 980 oz. which represent a value of $19,924. The sources are the same as last year; part of this production comes from the Copper-Sulphur ores of the Eastern Township mines and the balance is the product of the operations of the Champs d'Or Rigaud-Vaudreuil, who have a hydraulic plant near Beauceville. The silver is also from the same sources.

**Titaniferous Iron Ores.**—There were 2,949 tons of Titaniferous ores shipped to the United States during 1912. These were shipped as ores of Titanium. Part came from the mines of St. Urbain, and the balance from a mine situated at Ivry, near St. Jerome.

**Mica.**—The mica market was satisfactory this year. There is a substantial increase to record as compared with the previous year. As usual the production of mica comes entirely from the Gatineau and Lievu River district, to the north-east of Ottawa.

**Graphite.**—The shipments of graphite appearing in the table of production were all made from Buckingham, which is the center of the graphite industry in the Province. However, it may be mentioned that a company is building a modern and well-equipped mill at St. Remi, Township of Amherst, some 40 miles north-east of Buckingham, which is expected to start operations shortly.

**Peat.**—The Peat Industries, Limited, made returns of shipments of 500 tons of peat fuel, valued at $2,000. This company operates at St. Brigide, near Farnham, where a very complete air-dried peat fuel plant, of a capacity of 4,000 tons a year, is installed and working satisfactorily. The demand for this fuel is quite brisk and there is no question about the possibility of disposing of a large quantity.

The summer season of 1912 was exceptionally unfavorable for the production of air-dried peat on account of the rainy weather.

**Structural Materials.**—There is a marked increase in the production of the various structural materials, limestone, granite, marble, brick, cement, etc. This is as it might be expected, as the production of these substances increases with the development of the country.

It may be mentioned that the figures given for the structural materials are far from complete, as it is almost impossible to keep track of all the small quarries and brick-yards, a great number of which only work in a desultory way.

# MINERAL PRODUCTION OF ONTARIO FOR 1912.*

| Metallic. | Quantity. | Value. |
|---|---|---|
| Gold, ozs. | 89,080 | $ 1,859,285 |
| Silver, ozs. | 30,322,805 | 17,455,080 |
| Copper, tons | 11,116 | 1,581,062 |
| Nickel, tons | 22,421 | 4,722,040 |
| Iron ore, tons | 117,357 | 238,884 |
| Pig iron, tons | 589,593 | 8,054,369 |
| Lead (concentrates), tons | 26 | 1,290 |
| Cobalt oxides, etc., lbs. | 1,029,532 | 317,165 |
| Nickel oxides, lbs. | 117,160 | 11,716 |
| | | 34,240,891 |
| Less Ontario ore smelted into pig iron, 71, 589 tons | | 145,326 |
| | | 34,095,565 |
| **Non-Metallic.** | | |
| Arsenic (refined), lbs. | 3,927,347 | 79,297 |
| Brick, common | 385,000,000 | 3,178,250 |
| Tile (drain) | 16,463,000 | 279,579 |
| Brick, paving, fancy, etc. | 5,631,000 | 126,286 |
| Brick, pressed | 65,028,000 | 627,669 |
| Building and crushed stone | ......... | 953,839 |
| Calcium carbide, tons | 1,998 | 120,000 |
| Cement, Portland, bbl | 3,028,486 | 3,373,653 |
| Corundum, tons | 1,960 | 233,212 |
| Feldspar, tons | 12,133 | 24,416 |
| Graphite (refined), tons | 1,246 | 65,076 |
| Gypsum, tons | 31,331 | 50,246 |
| Iron pyrites, tons | 20,677 | 70,694 |
| Lime, bush. | 2,297,525 | 381,672 |
| Mica, tons | 318 | 36,634 |
| Natural gas | ......... | 2,267,897 |
| Peat, tons | 175 | 725 |
| Petroleum, Imp. gals | 8,432,730 | 344,537 |
| Pottery | ......... | 52,445 |
| Quartz, tons | 94,758 | 179,576 |
| Salt, tons | 90,986 | 450,251 |
| Sewer Pipe | ......... | 427,353 |
| Talc, tons | 5,902 | 53,118 |
| Total non-metallic production | | 13,376,425 |
| Add net metallic production | | 34,095,565 |
| Total production | | $47,471,990 |

### General Remarks.—Metals.

**Gold.**—For the first time in the history of Ontario there was a substantial production of gold. In 1911 the output had a value of $42,637; in 1912 of $1,859,285. The explanation is found, of course, in Porcupine, where the mines came into yield during the year. The Hollinger and Dome are the leading properties, and furnished the bulk of the production, but there are a number of smaller mines, several of which contributed to the yield, and others whose stamp mills are not yet completed and in operation. This group comprises the McIntyre, Vipond, Jupiter, McEnany and others. An unfortunate labour strike ocured in November, and to some extent lessened the output of bullion. In other gold districts such as Swastika, Larder Lake and Munro-Guibord, a good deal of development work has been done, but the era of steady production has not yet set in. At Long Lake, the stamp mill has been waiting for power, now nearly ready for delivery. The St. Anthony mine at Sturgeon Lake and the Cordova mine in Peterborough county both yielded considerable bullion.

**Silver.**—Cobalt well maintained its rate of production, the output of silver being a little over a million ounces less than in 1911. Owing, however, to the higher prices for silver, the money return to the mining companies was greater by about one and a half millions of dollars. It would appear as if the crest of production at Cobalt were reached in 1911, and that the descending curve brought the output in 1912 to nearly the same level as in 1910.

The total production since the opening of the mines has amounted to nearly 156 million ounces, and the total value to about 82 million dollars, as follows:

| Year. | Ounces. | Value. |
|---|---|---|
| 1904 | 206,875 | 111,887 |
| 1905 | 2,451,356 | 1,360,503 |
| 1906 | 5,401,766 | 3,667,551 |
| 1907 | 10,023,311 | 6,155,391 |
| 1908 | 19,437,875 | 9,133,378 |
| 1909 | 25,897,825 | 12,461,576 |
| 1910 | 30,645,181 | 15,478,047 |
| 1911 | 31,507,791 | 15,953,847 |
| 1912 | 30,260,635 | 17,455,080 |
| Total | 155,832,615 | 81,777,260 |

The tendency towards final treatment of the ore in the camp is manifested in the increased shipments of bullion, consignments of which amounted to 5,071,897 ounces in 1912 as against 3,132,976 ounces in 1911. The Nipissing and Buffalo mines are now equipped for reducing their entire output to merchantable bars on the spot. Nevertheless, the tonnage of ore and concentrates shipped to outside points was larger than in 1911, the respective quantities being 17,959 tons ore and 11,214 tons concentrates, as compared with 17,278 tons ore, and 9,375 tons of concentrates in 1911. The year of largest shipments was 1910, when 27,437 tons ore and 6,845 tons concentrates left the camp.

The largest producers during the year were as follows:

| | Ounces. |
|---|---|
| Nipissing | 4,680,670 |
| Coniagas | 3,703,942 |
| La Rose | 2,920,344 |
| Crown Reserve | 2,714,765 |
| McKinley-Darragh Savage | 2,694,560 |
| Kerr Lake | 1,895,309 |
| Buffalo | 1,890,150 |
| Cobalt Township | 1,505,396 |
| Temiskaming | 1,217,994 |
| O'Brien | 1,091,631 |

*Presented at the Ottawa Meeting.

In Gowganda three mines—Miller Lake. O'Brien, Millerett and Mann—produced in all 549,976 ounces, and in South Lorrain one—Wettlaufer-Lorrain—834,-119 ounces. The T. & N. O. railway branch line from Earlton to Elk Lake is now in operation.

As in previous years, the larger proportion of the high-grade ore and concentrates produced at Cobalt was treated in refineries situated in Ontario, the principal works being those at Copper Cliff, Deloro, Thorold and Orillia. At Deloro and Thorold, also at a small refinery opened during the year at North Bay, the oxides of cobalt and nickel are produced and large shipments made, both of refined cobalt oxide and of the mixed oxides and of the mixed oxides of cobalt and nickel, to the United States and European markets. Another by-product turned out by the refineries is white arsenic, of which nearly four million pounds were made during the year.

There was paid out in dividends by silver mining companies in the Cobalt camp over seven million dollars in 1912. The total distribution of profits since the beginning of the camp has been close upon 41 millions of dollars on a gross aggiegate return for sales of silver of $81,777,260.

New and important silver-bearing veins were found at La Rose, Cart Lake (Seneca Superior), Casey Cobalt, etc. The last named mine is significant of the possibilities of the conglomerate, situated as it is, on an outlier of this formation some 14 or 15 miles distant from Cobalt proper. The finding of good ore by the Beaver mine in the diabase underlying the Keewatin, and the recrudescence of the Cobalt Townsite mine were other features of the year.

**Platinum and Palladium.**—It is well known that platinum is associated in small quantities with the chalcopyrite in the nickel-copper ores of the Sudbury district. Accompanying the platinum is palladium, a silvery-white metal of the same group, which finds its chief uses in the manufacture of astronomical instruments, watch-making and dental work. There were recovered by the Orford Copper Works, New Jersey, in refining the nickel-copper mattes produced at Copper Cliff during the six years 1907 to 1912 inclusive, 2,864 ounces of platinum and 4,896 ounces of palladium, together with 15,675 ounces of gold and 459,250 ounces of silver. It cannot be specifically stated that tihs entire production was from the nickel-copper ores, since certain residues from other mines are treated along with the matte in the process of refining. Doubtless, however, a large proportion is traceable to the nickel and copper-carrying pyrrhotite. The value of the production was about $817,030.

**Nickel.**—Leaving out of account the nickel constituents of the ores raised from the silver mines of Cobalt, the production of nickel in 1912 amounted to 22,421 tons, being 5,372 tons, or 31.5 per cent., in excess of the production of 1911. There were 725,065 tons of ore smelted, the matte produced aggregating 41,925 tons. The mines operated by the Canadian Copper Company were Creighton, Crean Hill, and No. 2, and by the Mond Nickel Company, Victoria No. 1 and Garson. About 2,000 tons of ore were treated by the latter company from the Alexo mine, a new deposit in the township of Dundonald on the Temiskaming and Northern Railway, now being opened up.

Systematic and extensive operations with the diamond drill by the several companies in the Sudbury region have proven the existence of very large reserves of nickel ore. At the Murray mine, the Dominion Nickel Copper Company discovered a large body of ore some distance away from the outcropping of the former workings; at the Frood mine, the property of the Canadian Copper Company, the drill revealed what is believed to be the most extensive body yet discovered; and the Mond Company have located an extension of the Frood on their side of the boundary line. The Dominion Company, which had large holdings on the Northern Nickel range, including the Whistle mine, after acquiring the Murray mine, formerly owned by the Vivians, and the Gertrude and Elsie mines, which belonged to the Lake Superior Corporation, have sold out to a new company, said to represent the Rothschild interests. The prospects are for a large expansion in nickel mining in the near future.

**Copper**—Copper was produced to the extent of 11,116 tons, almost wholly from the Sudbury district, where it occurs associated with nickel. The output for 1911 was 8,966 tons, the increase for the year being about 24 per cent.

**Iron Ore and Pig Iron.**—The quantity of iron ore mined in Ontario in 1912 was less than in 1911 by 58,-274 tons. Shipments were from the Moose Mountain, Helen and Bessemer mines. The Grondal concentration plant at Moose Mountain and the roasting equipment at the Magpie mine (Lake Superior Corporation) are now both nearly completed, and if successful in practice will inaugurate the utilization of the low-grade iron ore deposits of the Province.

Of Pig Iron the output was 589,593 tons, as against 526,610 tons in 1911. The number of blast furnaces in operation was eight, as follows: Algoma Steel Company, Sault Ste. Marie, 3; Canada Iron Corporation, Midland, 2; Steel Company of Canada, Hamilton, 2; Standard Iron Company, Deseronto, 1.

## Non-Metals.

**Building Materials.**—The building trade was brisk in the cities and towns of Ontario, and there was an increased output of construction materials as compared with 1911, notably in brick and stone, also a small increase in Portland cement. Lime showed a falling off. The beautiful marbles afforded by the quarries at Bancroft are coming into use for decorative purposes, especially in public buildings. Trap rock is also quarried in Hastings county and used in the making of good roads near Toronto and elsewhere. The whole production of building materials amounted in value to $8,-641,369.

**Petroleum, and Natural Gas.**—The yield of petroleum again shows a decline, the quantity raised from the wells of Lambton and Kent counties being 8,432,730 Imperial gallons as against 10,102,081 gallons in 1911. Natural gas shows an increase, the output in 1912 having a value of $2,267,897 as compared with $2,186,762 the previous year.

**Minor Products.**—There is a long list of mineral substances produced in Ontario, none of them of prime importance, yet contributing to the aggregate output, and constituting the basis of considerable industries. Among these are corundum, which shows an increased production in 1912 of $86,504; graphite, increase $28,-711; iron pyrites, decrease $47,763; mica, decrease $6,-424; pottery, increase $1,945; quartz, increase $115,171; 584; feldspar, decrease $27,194; gypsum, increase $1..-salt, increase $19,416, and talc, increase $5,393. In most cases the raw material is abundant and could easily respond to a much larger demand.

# THAT NELSON PLATINUM, MR. FRENCH, AND SOME FACTS

We have been desired to publish the following letter. We do so without comment.

21st February, 1913.

The Honourable
The Minister of Mines,
Victoria, British Columbia.

Sir,—I beg to report as follows regarding my investigations into the alleged finding of platinum metals of that group in certain dykes in the vicinity of Nelson.

Last year I had a number of samples sent to me; these I sent to several eminent chemists for assay, all of whom reported that they were unable to detect even a trace of platinum metals of that group in the samples tested.

These results were published in detail in the report of this department for 1911—pages 165. et seq.

On October 1 of 1912, I proceeded to Nelson—at your request—to obtain other samples from the same and other localities, so that our samples would represent a wider range.

I made you a detailed report of my trip to Nelson, under date of December 18, 1912, which may be briefly summarized as follows:

I personally took the following samples, with the assistance of Mr. James McGregor, inspector of mines, and in the presence of the parties interested:

No. 7201—Devlin dike; general sample, upper and softer portion of dike;
" 7202—Devlin dike; general sample, lower and harder portion of dike;
" 7203—Patenaude dike; general sample, across dike;
" 7204—Patenaude dike, special sample of 2 feet next to contact;
" 7205—Beelzebub dike, Granite-Poorman Mine, general sample;
" 7206—Beelzebub dike, Granite-Poorman Mine, special sample of footwall.
" 7207—Greenhorn dike, Granite-Poorman Mine, general sample;
" 7208—Granite dike, Granite-Poorman Mine, general sample;
(It was from this dike that the 50 tons milled was taken.)
" 7209—Hardscrabble tunnel, No. 1, chute, general sample of dike.

In addition to the samplings made by me personally, the following samples were supplied to me:

" 7211—Monaghan dike, general sample, sampled by owner;
" 7212—Monaghan dike, general sample, 2 ft. next hanging wall, sampled by owner;
" 7269—McQuarrie & Robertson dike, samples supplied by owners.
" 7215—Sample given by Thomas Gough, manager Granite mine, to the Provincial Mineralogist and said to be a sample from "concentrates" made on Wilfley table, in 1911, during a run through the Granite mill of 50 tons of dike matter, taken from same dike as was sample No. 7208.

As the ratio of "concentrates" to the ton of ore is unknown, this sample would not determine the amount of metal in the dike, and was taken only to determine whether there was any platinum present even in ore so concentrated.

It was Mr. A. G. French who was primarily responsible for the alleged discovery of platinum, and I found in an interview I had with him that he claimed that the metals of the platinum group "were so elusive that no ordinary assayer, even the best, could find them upon assay, but that he (Mr. French) by his great experience had found a method of assaying that would show them."

I obtained from Mr. French a description of his method of assaying, which I had typed, and submitted a copy to him for correction; this was returned with slight corrections and initialled by him.

To show me the manipulation of his processs, Mr. French had some samples run through in my presence; those on dike matter were, however, abandoned, but a sample of concentrates was run through to the end.

The samples, re-agents, and operators were of Mr. French's selection, which was unimportant, as it was only the manipulation I was there to see, and the result was of no consequence, as of course I could not certify the results without control of operations.

Upon my return to Victoria, I had the samples I had obtained divided each into several identical samples.

There has never been any question as to the samples or sampling—the whole question has been as to the assaying of the samples, so to obtain the best expert determination on this point, I sent a set of four samples, each set identical, to a number of the most expert chemists, asking that they be "tested with the greatest possible care for metals of the platinum group, for even a trace, and if found, then in what quantities."

With each of these sets of samples I sent a copy of Mr. French's method of assaying.

Sets of samples were sent to the following parties, each set being identical and comprising Nos. 7203, 7205, 7211 and 7215:—

Canadian Government Bureau of Mines, Ottawa, courtesy of Dr. Eugene Haanel; this laboratory does all the chemical work of the Bureau of Mines and of the Geological Survey of Canada.

Johnson—Matthey & Co., London, England, Assayers to the Royal Mint, one of first authorities in England on Platinum assaying.

Dr. Frederic P. Dowey, Washington, D.C., chief Chemist to the U. S. Mint and the greatest authority in America on detection of minute quantities of platinum, the author of numerous papers on this special subect. (These were sent through the Geological Survey, whose courtesy and Dr. Dowey's is hereby acknowledged.)

Ledoux & Co., of New York, one of the best known assaying firms in America.

Consolidated Mining & Smelting Co.'s laboratory at Trail, whose chemists have become expert in this matter.

British Columbia Government Laboratory, Mr. Carmichael and Mr. Whittaker working independently, making two sets of assays.

The S. S. White Dental Company, manufacturers of platinum goods, New York.

With the notable exception of the S. S. White Dental Company (which will be remarked on later), each and every one of these experts to whom the question had been submitted reported that they were unable to find even a trace of any metal of the platinum group.

The following are extracts from some of the letters accompanying the certificates of assay:—

Johnson-Matthey & Co: "Our results are again of an absolutely negative character, and we can affirm that the samples contain neither platinum nor metals of the platinum group."

Dr. Dewey reports:

"Washington, D.C., Jan. 21, 1913.

"The Director of the Mint:

"Sir,—None of the samples from the Provincial Mineralogist of British Columbia, forwarded to us by the United States Geological Survey, show any platinum.

"No unusual occurence was observed during the assay, but no special test could be made for Canadium."

"Respectfully,

((Signed) "Frederick F. Dewey,

"Assayer Bureau of the Mint."

Ledoux & Co: "In examining these samples we have used assay charges four times as large as usual, and the results are negative in every case; we can assure you that none of these samples contain even a trace of platinum or any other members of the platinum group.

"We have assayed these samples by the method described as A. Gordon French's method, a sketch of which accompanied your letter."

Mr. Carmichael and Mr. Whittaker—In addition to the four samples mentioned also assayed each and every one of the samples brought from Nelson.

Mr. Carmichael says: "These assays were made with the greatest care, both by the assistant assayer (Mr. Whittaker) and myself personally, and I must now report that in no case were we able to find even a trace of platinum or any of the metals of the platinum group.

"The samples were tested both by Mr. French's method and by the generally accepted methods, and as a result, I am certain they do not contain any of the platinum group metals within the limits stated, that is, not as much as one ten-thousandth part of an ounce to the ton.

"To test whether there was even an 'infinite simally minute' quantity of platinum present, as is frequently found in the gold of this coast, we ran through the furnace, by Mr. French's method, 60 charges of 20 grammes each of sample No. 7215, 'concentrates,' equal to 1,200 grammes of material, combining all the buttons into one in the final cupollation.

"We next took 42 charges of 1 A T (29.,166 grammes), making 1,225 grammes of materials, which we ran through by the regularly adopted methods joining all the beads into one on the final cupollation. These two beads were treated separately, and any possible platinum condensed into a solution of about 1/20 c.c. in volume, and each of these solutions tested qualitatively, by potassium iodide, showed the presence of platinum 'in infinitely small quantity'—as near as possible to estimate, I should say the platinum present amounted to about sixteen (16) cents worth of platinum in 10,000 tons of ore, an amount quite negligible and only discernible upon treating a great amount of material—more than 1,220 grammes.

"I have carefully looked into the method of assay as proposed by Mr. French, and have experimented with it, and I fail to find any merit in it, either from a chemical or practical viewpoint."

The S. S. White Dental Company—as already noted—report that they find platinum and gold in each of the four sample sent them, as follows:—

Sample.

No. 7203—Platinum, 0.033 oz.; gold, 0.035 oz. per ton;

" 7205—Platinum, 0.088 oz.; gold, 0.108 oz. per ton.

" 7211—Platinum, 0.042 oz.; gold, trace

" 7215—Platinum, 0.119 oz.; gold, 1.136 oz. per ton.

The company, as such, has a high commercial standing, but of the skill or experience of the assayers employed by the company, I have no means of judging. The company, however, is engaged in the manufacture of platinum goods on a large scale and its laboratory is naturally an adjunct to its manufacturing business, so that it is quite possible, and even probable, that its laboratory—and even utensils—were so saturated with platinum as dust and otherwise, as to render any samples treated there open to grave suspicion of contamination and the results subject to question.

The firm does not do assaying or chemical analysis as a business—although in this case it was paid for these assays—and has no public rating as analysts. My only reason for sending samples to this firm was the fact that a number of person in Nelson had received from it returns of platinum in these dikes, and it was largely due to these assays that local credence was given to the alleged discovery, and that this "platinum excitement" was started.

Some years ago we had an experience with another firm of platinum manufacturers—near New York—who reported to prospectors high platinum results in ore, which subsequent investigations proved to be not founded on fact; this was accounted for by contamination in the laboratory of the platinum works, the probability of which, in such a laboratory, is known to any assayer of experience. In fact, it is usual to exclude all bullion assaying from the room in which assays of ore are made.

In making this investigation I have simply obtained the samples and Mr. French's method of assaying. These I have submitted for the best expert advice obtainable, and in making this report to you of the result of the investigation, I do not need to express any opinion of my own. I merely give you the verdict of the experts employed, which may be summarized as follows:—

Seven of the most expert assayers in England, the United States and Canada—including the Geological Surveys of the two latter countries—report that not even a trace of platinum is present.

The laboratory of a firm of platinum manufacturers reports from 0.033 (33-1000) to 0.088 (88-1000) oz. per ton on dike samples and 0.110 oz. per ton on the "concentrates.

Any comment on the above results appears to me to be unnecessary.

I am, sir, respectfully,

(Signed) Wm. Fleet Robertson,

Provincial Mineralogist.

# THE GEOLOGIST.†

(Written for the Annual Meeting of the Canadian Mining Institute, by H. E. T. Haultain.)
Ottawa, 1913.

For the sixth year in succession the president of the Canadian Mining Institute is a geologist. Ontario has its Provincial Geologist and British Columbia its Provincial Mineralogist, and the Dominion its Geological Survey. These are all of importance to the community. The standing of the geologist in all branches of his activities, and they are varied, is taken as a matter of course. In a public way it is neither questioned nor criticized. So quietly and universally is this the case in Canada that the half brick** that the spur of the moment caused me to throw at the action of certain geologists last March had all the appearance of a bombshell. Judging from the many comments during the past year it must have shattered into its original grains of sand and these must have found lodgement in many tender spots wide of the original line of aim. But though my brick was fashioned on the spur of the moment (and hence lacked sufficient coherence) it represented a feeling that has been growing and is sane and sound.

The geologists are a large group and count among their numbers men eminent in the community. Their general average is high. They touch on the one hand ultra-academic learning and on the other the popular progress of the country. Owing to their special field of research they are segregated. They are more or less separated by gulfs from other scientific men and are in a position to present a united front, which in itself is sufficient to deflect criticism or attack. But in addition they are surrounded, they surround themselves individually and collectively, by one of the finest assets of defence, a well-carried dignity. Furthermore, they are coming this summer to this country from all over the world, and to a very large part of the community they will appear of magnificent importance. They will be our guests and we shall be their hosts, carrying all the responsibilities that are entailed thereby. One may well hesitate before criticizing.

Nevertheless, there are aspects of the case that should be considered, and I hope to put before you certain ideas that may call forth profitable discussion. Succinctly, but perhaps crudely, geology is the science of rocks and mineralogy the science of minerals. Minerals are the basis of the mineral industry and minerals are found in rocks, hence the syllogism is apparently complete. Geology and mineralogy are the basis of the mineral industry. This is such a fine, comfortable, broad generalization that it is commonly accepted for very much more than it really means.* It would be as well to confess at once that this is the source of any peevishness, and of the tender spot, the irritation of which last March caused the throwing of the brick. Into the details of this phase of the matter this is not the time or place to enter.

The early reports on the geology and mineralogy of the Cobalt district issued by the Ontario Bureau of Mines were a model of utility. Cobalt is a remarkable case. Perhaps there is no other metalliferous camp in which the commercial values are so clearly and so simply affected by geological conditions to the degree that exists in Cobalt.

The early recognition of this, the publishing of it in clear, unmistakeable manner, so that the early prospectors and miners could understand was a magnificent piece of commercial geology applied to metalliferous mining.

Should the various geological departments throughout the Dominion fail to achieve the like of this again in a generation, still their existence would be justified by a possibility of this alone.

In this particular case the geologist could and did "see into the earth farther than the ordinary man." He could foretell with fair accuracy the extensions of the contacts and thus, in many cases, foretell definitely the commercial conditions at depth. This probably lent added local importance to geology, and geological conditions become a very important feature of all reports on mineral properties. Alleged geogicial features and broad conclusions supposed to be derived from them became a prominent part of all newspaper boom talk, and of all the wildcat reports with which the community was flooded. Many men with a smattering of geological knowledge and some geologists with little or no experience either geologically or com-

†Editor,s Note: This paper is intended by Mr. Haultain to be one of the series on "Toronto University and the Mineral Industry.
*See "The University of Toronto and the Mineral Industry" Page 136, March 1, 1913.
**See "The University of Toronto and the Mineral Industry." Part II., Canadian Mining Journal. August 1, 1912. Page 510.

mercially with mining, posed as experts. Geological nothings were learnedly interpreted into optimistic reports and drew out much money and many failures. Should all this be laid at the door of the geologist? Certainly not. It is characteristic in greater or less degree of every mining boom. But it existed here, I think to a greater degree than usual, and with a very few, perhaps notable exceptions, geologists let it pass without comment, while others helped it and fanned it, possibly unwittingly, by their serious and seemingly important discussion of hopelessly unimportant academic details. These remarks are by way of being very general. They are perhaps not specific or explicit enough to provoke a profitable discussion. That particular phase of the subject does not lend itself to explicitness. It is a matter of degree. Every man must decide for himself to what extent there was posing and what was probably the motive of the posing. But I will try to be specific and, to many, the explicitness will be so obvious that they may not accept it as a subject for discussion.

Is it too simple to assert that a geologist is not, as a consequence of his geology, a mining engineer? Yet there are those who claim that geology is such a large part of mining that a geologist is as a result a mining engineer. The truth is that a mining engineer is to a large extent a geologist. He concerns himself deeply with his branch of geology. He knows much geology and studies much of such geology as applies to his work. The geologist knows much more geology and studies it more intensely, but their points of view are very different. A geologist may have spent years mapping mining districts, and yet not be a mining geologist. He may be a very valuable man at mapping the district and yet be quite unsuitable to report on the value of an ore body. A man may be a keen and successful student of the life history of certain phases of ore deposition and yet not be a suitable man to estimate the risk involved in opening up an ore body. A man may be a renowned histologist or anatomist and yet be a very poor judge of a man. The botanist plays a small part in our lumbering interests. Our chemists and druggists are not physicians. Bacteriologists do not report on sewage disposal, and our physicists, with all their profound knowledge of gases, neither design gas engines nor become aeroplanists. In fact such is generally the case. The point of view is so different that the man who is keen on the scientific side is handicapped if he enter the commercial side.

A geologist cannot become a mining engineer, cannot become the right man to report on a commercial proposition (that is to estimate a risk) without a special and lengthy training, which he can get only in actual mining operations. A geologist can no more become a mining engineer by simply saying so than can a new graduate of a mining course in a university. Each has a good training, enabling him to become a mining engineer through experience, but of the two the new graduate is nearer the goal on account of his flexibility and on account of his broader perspective.

Some geologists do become mining engineers; we have notable examples, but it is by means of experience in actual operations.

On the other hand all mining engineers must have considerable geological knowledge, their paleontology may be weak or practically non-existent and their optical crystallography likewise, but their working knowledge of ore deposits is not only general and broad, but of useful phases it will be detailed and intimate.

The average mining engineer knows much more about ore deposits than the average geologist and what is very much more important, his point of view is quite different. Two Porcupine veins may have a similar life story and be each of intense interest to the geologist and may be the subject of unending dissertations, but one may be very valuable commercially and the other worthless without in any way affecting the interest of the geologist. Speaking broadly, the quartz is the main source of interest to the geologist, the gold to the engineer. There are those, however, who like to say that because the engineer's eye is on the gold he sees nothing else unless a geologist comes along and interprets things for him.

For the engineer there are many basic sciences—geology is only one of them. Mathematics is as much a basic science. Mining engineering without geology is impossible; it is also impossible without mathematics, but the mathematician is no more a financier than is the geologist a mining engineer. It is the function of the engineer to co-ordinate the sciences to a definite end. The mining engineer estimates risks, and to do this he must balance up many things of which geology is only one. The mining engineer gets results which call for co-ordination of knowledge of different branches of science, and calls for compromise.

To question the value or importance of geology to mining would be foolishness of a very inane kind. It would be fully as foolish as to question the value of arithmetic, but much geology has as little to do with mining as have quanternians.

To our more important geologists this is obvious, but there are those who would foster the other idea and there is indeed abroad in Canada a false idea of the real importance of geology to mining.

The mining engineer needs the geologist. He appreciates the geologist and his stories better than can anybody else, and he can make more real use of the geologists' knowledge than can anybody else. The geologist has the time and opportunity and the conditions that permit him to study geological problems as pure scientific problems. He can stop and carefully study the effect of varying conditions of high temperature, of chemical reaction, or time, of capillarity, and of many more or less obscure conditions, and with his study he can often tell us with rough accuracy the life history of some of our ore bodies, he can in truth be an authority "on an almost absolutely unknown region." What really magnificent stories the geologist has told and can tell the mining engineer. Has any engineer ever been told a more beautiful story than that of magnetic segregation or of metasomatic replacement, and is not the whole subject of magmatic waters, magnificent inspiration to thought and spur to greater study? But some geologists are about to forget that this is only a part. They are inclined to think that the life story of an ore body is everything or nearly everything, whereas the engineer recognizes that it is only a part and often a very insignificant part of what is really required, for often it helps him no more in relation to his desired result than does his mathematics or his physics. Many geologists are apt forget that all that is known under the headings of geo-chemistry and geo-physics do not but touch matters of vital importance to the engineer. There are generally other causes and facts of much greater importance to the engineer and to the community. There are causes and effects not yet classified, with only a generic name, and that probably a false one. The causes giving the most important features of an ore-body are causes not required, not considered, not included in the stories of the geologist, but to the engineer they are paramount, they are the causes known as chance. That the source of a river is higher than its mouth is due to the very well-studied laws of gravity, but the twists and turns of the river, its falls and its navigability are the results of chance. An ore body may clearly be the result of magmatic waters, but whether a particular part will carry $2 or $20 worth of mineral is a matter of chance; is a matter of so many varying causes that no geology can follow them.

Once in a while geology can give us very definite information not on the varying values but on the limitations of extensions of our ore body.

In general the training of the geologist dealing as it does with broad generalities, with life histories, with generalizations rather than with detached facts, gives him a perspective that is a serious obstacle when he tries his hand at estimating the commercial risks of ore bodies. It is not profitable though it would be easy to be specific here; many of us carry in memory and some of us on our files, examples of this kind of thing.

But enough, the work of the geologist is of certain value to the mining engineer, but as far as mining and the estimation of mining risks is concerned the work of the geologist is for the engineer. The geologist is a scientific specialist, the engineer is the co-ordinator. The geologist cannot become a co-ordinator without special training which entails actual experience of operations, and geology is only one out of may things that the engineer has to consider. It is often, in metalliferons mining very often, of a type that the engineer takes in his daily stride as it were.

This much must be sufficient concerning the relation of the geologist to the engineer, the discussion will I hope carry it further.

There is another phase upon which I must touch and that is the relation of the geologist to the community. Not only have the three last presidents of the Canadian Mining Institute been geologists, but the president of the American Institute of Mining Engineers is a geologist, the Dean of the Faculty of Applied Science of McGill is a geologist, the late renowned Principal of McGill was a geologist. Van Hise is President of the University of Wisconsin and Geikie is president of the Royal Society. We find geologists holding important public positions in all parts of the world and holding them successfully and with distinction. The geologists are an ancient and honourable body. I can find no reference of slur or suspicion remaining attached to them. They have been clean and kindly men. Taking the geologists that I know personally I find them delightful men, agreeable companions and general favourites wherever they go. Of course there is always the exception that proves the rule, but I believe you will all agree with me when I say that in general pleasantness the average of the geologists is higher than the average of most of the other groups of men with whom we come in daily contact. They are not only prominent in their scientific work, but they are prominent in the community, and the Canadian public at large accepts them not only as being of great importance to the state scientifically, but as being above the average good citizens.

In remarkable contrast to these public successes of the geologist, I find the condition of the engineer, not only the mining engineer, but the engineer in all branches. The engineer is doing the world's best work to-day. All that counts for prosperity and health and material growth is based on the work of the engineer. All that we are most proud of in this young nation is dependent upon the work of the engineer. The engineer exists in large numbers. Even in Ottawa there are more engineers than geologists. But we find very little public recognition of the engineer. We seldom if ever find him holding a public position of responsibility or honour outside of his immediate work. We have no engineers in Canada who are members of the Royal Society, and if we have one who has been knighted it is simply the exception that proves the rule. Why? How is it that the geologists beat the engineers to the high positions? Is it because their work is of greater importance to the state? Is it because their work is of a higher type? One would think so from the results. Is it not patent? Is it not obvious? But unfortunately the truth is not always obvious. Truth is oftener at the bottom of the well than prominent on the horizon. We must carry our analysis further. I submit that there is another and simpler reason. When we analyze the work and effort of the geologist we find it made up of two separate and distinct functions. The engineer's time and effort is devoted entirely to his engineering work. A part only of the geologist's time is devoted to the study of geology. A large part, and some times the larger part, is devoted to descriptions of his work, to publicity. One of their functions is that of the story teller. From the beginnings of their existence they have been great story tellers. In fact, they have been the champion story tellers of all time. Now there is no doubt in my mind that some geologists, or near-geologists, will consider that this is another half brick in poor disguise. But let us see what the story teller has been to the community. When we go back to the beginning of things, that is to the beginning of things for man, to about the time, let us say, of pithecanthropus erectus, the story teller was beginning. He was almost the first luxury. Possibly man's first distinction was that he was a fire-using animal. Certainly about the same stage of his development he became a story-telling and a story-bearing animal, and the story telling part was certainly more removed from mere animal than any other phase of his activities. Progress in all stages has been based largely on co-operative organization and this came first with the fighting animal, but organization alone did not win out from the animal stage. Organization could and does exist without language and without man, but we departed from the animal through language and progressed through language. Language was produced by and for the story teller. For his purpose was language developed and without language we would have had no modern man. The neolithic scriber on bone, that "mamothistic etcher at Grenelle" was a later development of the story-teller, who told stories in pictures and was not only the forerunner of the comic supplement, but of all that we understand in modern pictorial art. Later he told stories in song and in mimicry so that all our art, which represents our greatest departure from the anthropoid ape is the work of the story teller. He has been in the vanguard of all progress since we left the trees.

It is impossible to conceive of a geologist being eminent without this story telling function being well developed. Unlike most story tellers he generally tells his own story of his own work. He is his own publicity agent, and what magnificent stories he has been able to unfold. In the second chapter of Genesis and the second verse, we are told that God rested on the seventh day and for a thousand years man had interrupted all his work every seventh day to signify his assent to the six day history of the world's creation. The story telling geologist comes along and says: "There is a mistake somewhere; it took several million years to create this earth and I can prove it, here are the proofs." When the world had become accustomed to the shock of this the geologist's story went on to tell that man was not created on the sixth day, but that his creation was a gradual development occupying a period also of millions of years, the records of which in an almost unbroken chain stretching from the protozoa to modern man aré preserved in the everlasting rocks. True some links were absent, but every now and then the story is added to and the Neanderthal skull and our friend from Java help to fill in the blanks. Who couldn't attract attention and hold the stage with such stories as these? And the geologist had many such in his bag. He shows us where the moon was born. He dissects the teeth of the mammoth who wandered on our back yard before the ice was two miles thick upon it and he counts the nervatures of the wing of the fly that plagued it.

But even the geologist's supply of stories could not keep up forever to these high-grade samples and as the family of geologists grew they had to be content with less and less interesting stories. But stories they must have to maintain their eminence and a story to be a story entails of necessity a hearer, a willing and an interested listener. As the quality of his stories waned he often had to expend as much pains finding the listeners as in finding the story, and this led him to the study of the listener, to the study of man, his characteristics, his wants, his needs, his foibles, and his weaknesses. He had to make the most of meagre stories, he had to study that phase of man which brought him listeners. This has ben going on for generations and the methods of the family of geologists in finding hearers is as well organized to-day as their study of geology. Are not many of them geologists in the summer and writers of their stories in the winter?

Now the story teller is still the greatest man among us. What does Kipling get per word? and has he not had the refusal of the high honours of the realm? Theodore Roosevelt received $350,000 for seven years' work as President of the United States, but received a million dollars for the story of his African holiday. But the geologists' stock of interesting stories is running low or rather the proportion of interesting stories to the number of geologists is becoming small, and instead of a greedily paying public he must perforce fall back on government Bluebooks for publication.

And how do I interpret all this? I interpret it thuswise. The work of the geologist is in two parts. There is the study of geology to get the story and of man to get a listener. The engineer is so busy with his own work that he fails to study man. The geologist, with his knowledge of man and with his knowledge of publicity becomes useful to man in other ways.

The search for a listener has made the geologist in many ways a broader and a bigger man and his art of story telling brings him into the public eye.

Do I begrudge the honours to the geologist who has reached to high position through his knowledge of man? By no manner of means. I respect him, in some cases I bow down to him, but let us be honest about it and recognize that it is not the geology, but the story telling and the man that has won to high honour.

Why then my half brick of last year? It was not directed at the geologist as a geologist or as a story teller but at men who were inclined to tell stories of no consequence to listeners provided by the reputation of the whole family of geologists and to make capital out of these stories of no consequence. The geologist has from time immemorial been on a pedestal, and has no doubt taken care to be kept there. Round and about him due to his art of story telling there has been a halo or an auro. His stories have not only had the important essentials of mystery and distance, but, in the main, they have been truthful and unquestioned by the general public. But there are those who would impose on this good name and on this long-earned and carefully preserved reputation.

I must confess that it is a source of some content to see the radical change that has taken place in our programme since last year, with the greatly reduced percentage of geological papers. There are many geological stories that we require, but that fact need not be abused.

This summer the geologists from all the world are coming here, and they will bring with them their best stories, and we, aided by government grants, have been diligently preparing for them not only to hear their stories, but to provide them with new stories.

Their stories will be lstened to by all manner of people, but by no one will they be more appreciated than by the mining engineer, for he will know and will preserve what he needs and this he will use in practical work for the benefit of the community and, going his own way, he will hold his peace and be unrecognized, and to the geologist and to the story teller will be the glory.

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### Discussion of Mr. H. E. T. Haultain's Paper on "The Geologist."

Remarks by Mr. R. W. Brock, Director the Geological Survey of Canada.

Mr. Haultain's remarks at the C.M.I. meeting last year were jocular and, therefore, called for no serious rejoinder. Moreover they were restricted to certain geologists and would be equally applicable to certain mining engineers or certain men of any other profession. His carefully prepared and admirably written paper presented to this body at the present meeting I should like to dscuss, but I perceive that it has been anticipated and effectually disposed of by Paul the Apostle in his first epistle to the Corinthians. For the convenience of those members who have not access to a reference library, I shall quote a few verses from the twelfth chapter:

"For the body is not one member, but many.

"If the whole body were an eye where were the hearing?

"If the whole were hearing where were the smelling?

"But now hath God set the members every one of them in the body as it hath pleased Him.

"And if they were all one member where were the body?

"But now are they many members yet but one body.

"And the hand cannot say unto the eyes I have no need of thee, nor again the feet to the head I have no need of you.

"Nay, much more those members of the body which seem to be more feeble are necessary;

"And those members of the body which we think to be less honourable upon these we bestow more abundant honour; and our uncomely parts have more abundant comeliness.

"For our comely parts have no need; but God hath tempered the body together, having given more abundant honour to that part which lacked.

"That there should be no schism in the body; but that the members should have the same care one for another.

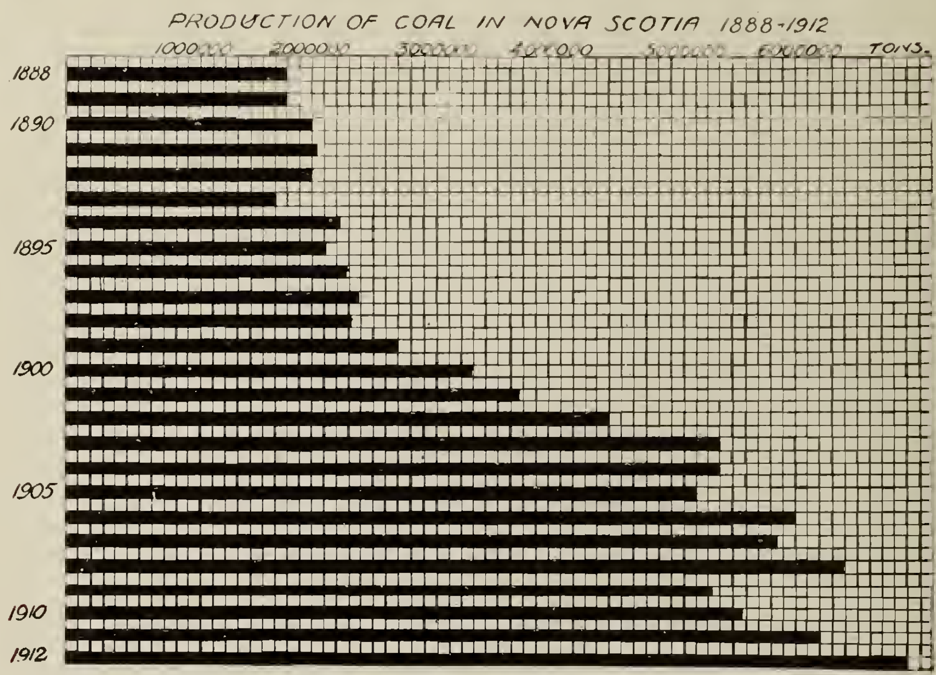
"And whether one member suffer all the members suffer with it; or one member be honoured, all the members rejoice with it."

# NOTES FROM THE ANNUAL REPORT OF THE DEPARTMENT OF MINES OF NOVA SCOTIA.

**Nova Scotia Mineral Production.**

Year ended September 30th, 1912.

| Mineral. | Quantity. 1911. | Quantity. 1912. |
|---|---|---|
| Coal raised (gross tons) ........ | 6.208,444 | 6.802.997 |
| *Iron ore (net tons) ........... | 53.595 | none |
| Pig iron made (net tons) ...... | 397,614 | 411.388 |
| Steel ingots made (net tons) ... | 438,922 | 561.392 |
| Limestone quarried (net tons) .. | 525.286 | 473,067 |
| Coke made (net tons) ......... | 545.619 | 603.372 |
| Gypsum quaried (net tons) ... | 333.358 | 280.000 |
| Building stones quarried (net tons) .................. | 11.226 | 11,644 |
| Bricks made (number) ........ | 23.273.700 | 22,348,486 |
| Drain pipe and tile made (feet). | 1.431.761 | 984,922 |
| Grindstones quarried (net tons). | 380 | 400 |
| Gold bearing ore mined (net tons) | 18.320 | 15.868 |
| Gold produeed (ounces) ....... | 8,389 | 4.948 |
| Manganese ore (net tons) ..... | 150 | 233 |
| Antimony concentrates (net tons) | 191 | none |
| Moulding sand (net tons) ...... | 380 | 1,190 |
| Tungsten concentrates (net tons) | none | 14 |
| Sulphate of ammonia (gross tons) | 3.971 | 5.213 |
| Barytes .................... | | 974 |




## Coal Trade.

The returns of eoal sold during the year 1912 show, compared with the returns for 1911, as follows:

| | 1911. | 1912. |
|---|---|---|
| Nova Scotia ............... | 2,108,665¾ | 2.295,363 |
| New Brunswick ........... | 541,591 | 653,938¾ |
| Newfoundland ........... | 184,195¼ | 200,642 |
| Prince Edward Island ...... | 80.637 | 92,302¼ |
| Quebec.................. | 2,067,831½ | 2,159,005 |
| United States ............. | 332,301 | 412,531 |
| St. Pierre ................ | 9,024½ | 9,406¾ |
| Other countries ........... | 1,992 | 91,825 |
| Bunker .................. | 204,681 | 236,733¾ |
| Time chartered boats ....... | 25,545 | 25,867½ |
| | 5,556,464 | 6,177,615 |

*Iron ore imported 1910-1911, 853,904; 1911-12, 880,409 net tons.

## Cape Breton County.

The produetion for the year 1912 was 5,197,601, as compared with 4,736,026 for the year 1911. The largest producers were the Dominion Coal Co., Ltd., with an output of 4,332,320, and the Nova Seotia Steel & Coal Co., Ltd., with an output of 821,165 tons.

The reports of Mr. Neil A. Nieholson and Mr. John J. MeNeil, Deputy Inspector for the districts of Cape Breton, give (pages 17 and 52) for their district, detailed information eoneerning the collieries and their operation.

## Pictou County.

The production for the year 1912 was 682,883 tons, as compared with 727,944 tons for the year 1911.

The principal produeer was the Acadia Coal Co., Ltd., with an output of 439,476 tons.

The report of Mr. Thomas Blackwood, Deputy Inspector, for the pictou district, gives (page 94) for his district, detailed information concerning the collieries and their operation.

### Cumberland County.

The production for the year 1912 was 632,809 tons, as compared with 411,695 tons for 1911.

The reports of Mr. A. V. Cameron and Mr. E. B. Paul, deputy inspectors, give (page 148) detailed information concerning the collieries and their operation in the Cumberland district.

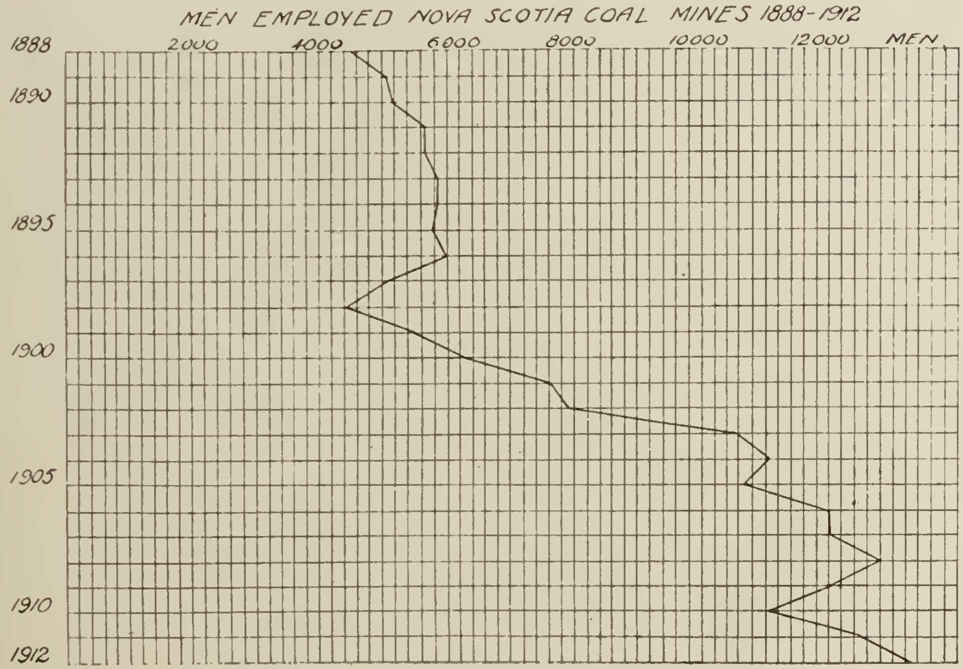
### Inverness County.

The production for the year 1912 was 289,704¼ tons, as compared with 332,779 tons for 1911.

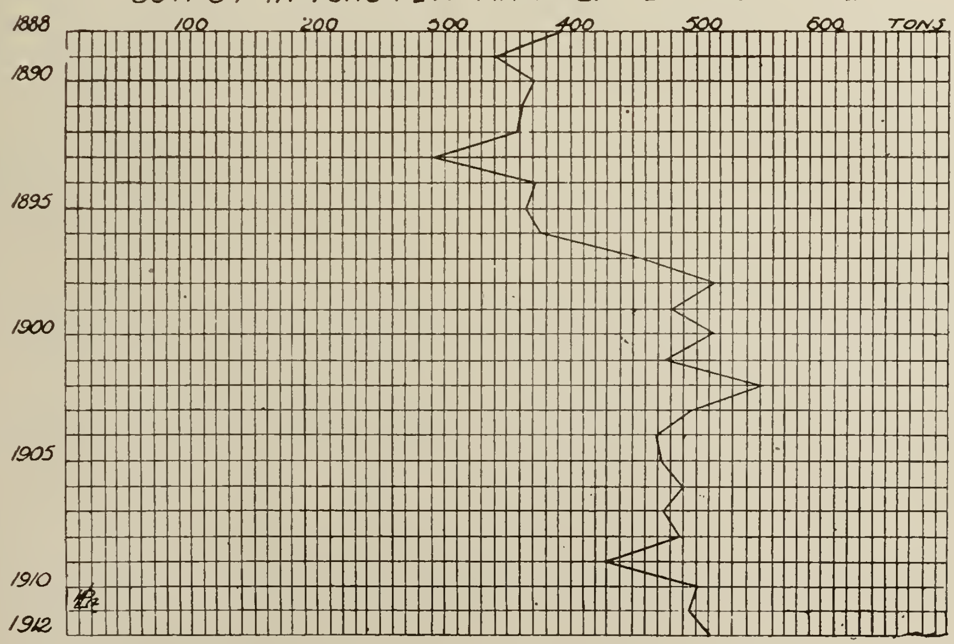
The whole production was by the Inverness Railway and Coal Company.

The report of Mr. W. F. Davis, deputy inspector for the district of Inverness, gives (page 135) detailed information concerning the Inverness Railway and Coal Company's Colliery and its operation.

MEN EMPLOYED NOVA SCOTIA COAL MINES 1888-1912




OUTPUT IN TONS PER MAN PER YEAR 1888 - 1912




### METALLIFEROUS MINES.

The minerals other than coal, mined in the Province during the year, were gold, manganese, tungsten and barytes.

The report covering the operations in connection with these minerals by Mr. H. B. Pickings, deputy inspector of mines, is contained in the following pages.

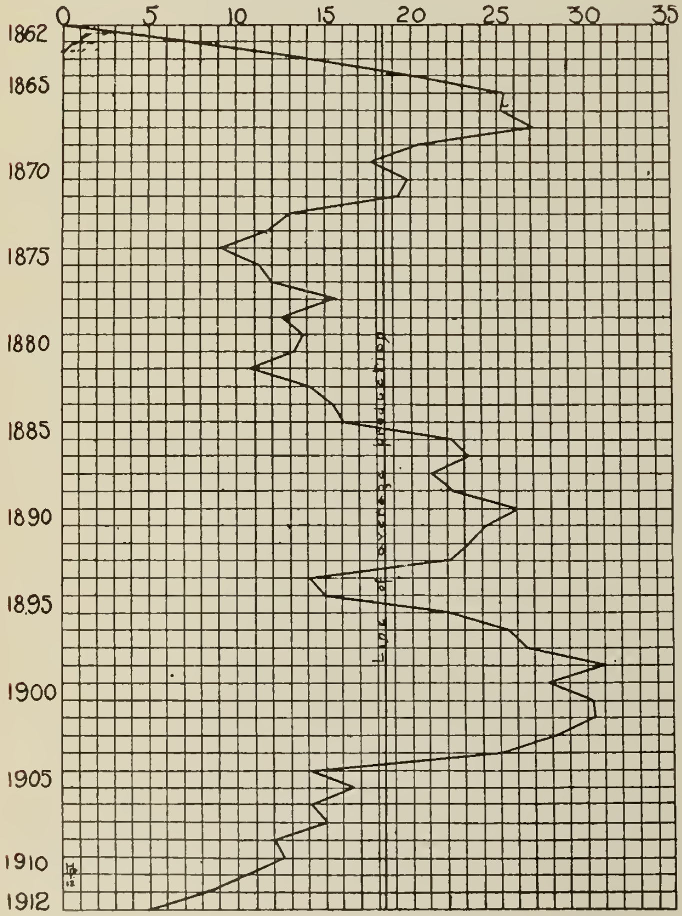
### Gold.

The production of gold was 4,949 ounces recovered from 15,862 tons of gold bearing rocks mined and crushed. This production having a value (at $19.00 an ounce) of $94,031.00 equaling an average recovery of $5.99 a ton crushed.

Compared with the production of the year 1911 this year's production shows three decreases as follows: 2,452 less tons crushed; 3,441 less ounces of gold recovered, and $2.71 less in the value of the average yield a ton.

The gold production is lowest since gold mining was established as an industry in the province; and it is almost needless to say is most disappointing. It is, however, but justice to the industry to say that it does not fairly represent the extent of the operations carried on, as at several of the districts the principal efforts of the operators were directed to mine development and prospecting rather than to immediate recovery of gold. At Tangier, the Dominion Leasing Co., had at the close of the year commenced only to recover from the setback caused by the destruction by fire of their charthouse and power buildings. At Lake Catcha the operations of the Petpeswick Mining Company were almost wholly of a prospecting and ore-development

YEARLY YIELD OF GOLD
1862 to 1912




nature, and at Caribou and Fifteen-Mile brook, a great percentage of work done was that the miner terms "dead work." At Shier's Point and Goldenville the surface equipments have received much more attention than the underground workings.

The properties on which operations were carried on were the following:

Byron Bower, Carleton.
Tonquoy, M. J. O'Brien and tributors, Caribou.
Stillwater Mining Co., Moose River.
Switzer Mining Co., Fifteen-Mile Brook.
Uniac Mines & Power Co., Gold River.
W. McBrennan and tributors, Oldham.
M. J. O'Brien et al, Renfrew.
New England Mining Co., Stormont.
Sydney Gold Mining Co., Stormont.
Seal Harbour Mining Co., Stormont
Boston and Goldenville Mining Co., Shier's Point.
Goldenville Mining Co., Sherbrooke.
Dominion Leasing Co., Tangier.
Gladwin Gold Mining Co., Beaver Dam.
S. R. Giffin & Sons, Stormont.
Petpeswick Mining Co., Lake Catcha.

I regret to have to report one fatal accident which occurred at the Dominion Leasing Company's mine at Tangier. Particulars of this accident will be found in the detailed report on this mine.

Generally speaking, the underground workings are in good condition and the requirements of the "Regulations of Metalliferous Mines" have been generally complied with. Some complaints have been made by mine managers that these regulations in not making more distinction between "mining operations" as permanent work and "prospecting operations" as temporary work, impose hardships that are detrimental to the expansion of the industry, and it would appear that there is some justice in their complaint and that this is a matter that should receive consideration, affecting as it does not only gold mining, but all mining and prospecting for minerals other than coal. Another feature of the Act that is more or less freely criticized is the manner of leasing and holding gold areas for speculation purposes, rather than for mining operations. There is no doubt that this feature of the Act as it stands to-day is having the effect of causing much property to remain unoperated that otherwise would receive attention. I realize that legislation, to successfully cope with these matters, without being productive of new features possibly just as objectionable as the features to be overcome, is a difficult problem, but at the same time the opinion is expressed that it is possible to pass legislation that will do away, to a great extent, at least, with this objectionable feature, and that such legislation would have an immediate and lasting effect for the expansion of the industry.

### Iron.

Since the closing down of the mines, at Torbrook, of the Canada Iron Corporation in 1911, no iron ore has been mined in the province. The Canada Iron Corporation have concentrated ore from their stock pile, however, and shipped several cargoes. Prices have improved, and the above-mentioned company is now commencing operations preparatory to reopening their mine.

Near Glencoe in Inverness County considerable prospecting has been engaged in on a very promising body of iron ore, taken up by John S. Hart.

### Antimony.

At West Gore, the West Gore Antimony Co., retimbered a part of their main shaft, but as yet no ore has been mined, and the mill has remained idle during the year.

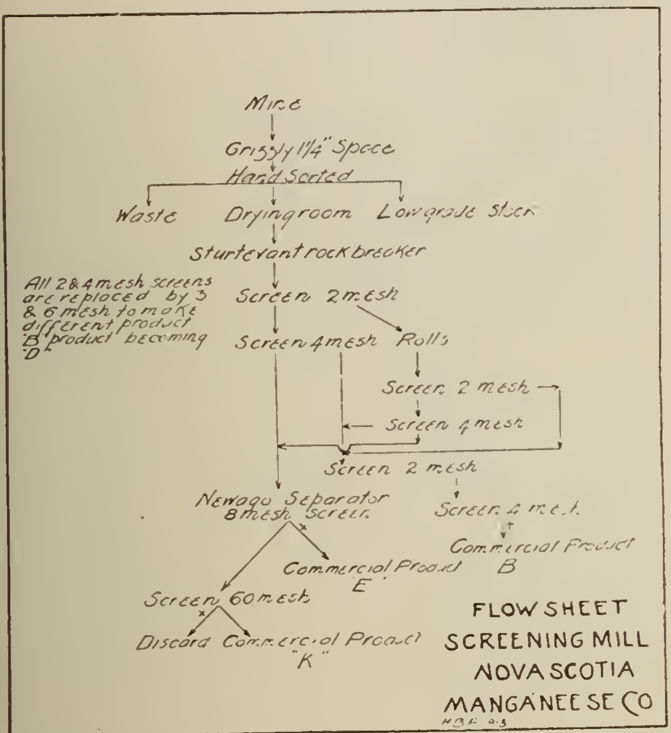
### Manganese.

The Nova Scotia Manganese Company at New Ross, continued development work and raised 233 tons of ore recovered from this development work. The new road to tide water by way of Benjamin's Mills, is nearing completion, and stoping of ore is soon to be commenced.

No other properties were operated during the year in connection with the mining of this mineral.

### Tungsten.

The first shipment of Tungsten-bearing mineral from Nova Scotia, namely, 14 tons of scheelite concentrates containing 72 per cent. tungsten acid, were shipped during the past year from the Scheelite Mines, Limited, Scheelite, Moose River. The concentrating mill con-




structed in 1911 was operated, producing a very high-grade concentrate. Development work at the mines of this company was continued and prospecting for tungsten-bearing minerals has been engaged in at a number of places in the province.

### Barytes.

A total of 974 tons of barytes was mined by the Barytes, Limited, at Scottsville, Inverness Co. This company have put their new mill in operation, and during the year have shipped their manufactured product as far West as Winnipeg.

### Oil.

The Maritime Oil and Gas Co., Limited, have continued their oil-well boring operations at North Lake Ainslie.

To date, five test-holes have been put down to various depths as follows:—

| | Feet. |
|---|---|
| No. 1 hole | 800 |
| No. 2 " | 1612 |
| No. 3 " | 1120 |
| No. 4 " | 1100 |
| No. 5 " | 870 |

No. 6 hole is about to be started

These holes are all located within a territory at North Lake Ainslie, of about one square mile in extent.

Oil sands and natural gas have been encountered in all holes, and it is stated that at No. 2 hole over 215 feet of oil sands were drilled through, two of the beds encountered being 75 feet and 130 feet in thickness, respectively. This No. 2 hole has been cased and capped, ready for shooting, which is being delayed until another hole has been put down to the 75 feet bed. The drilling is being done with a standard oil drilling equipment as supplied by the Oil Wells Supply Company. The derrick used is 75 feet high.

The size of No. 1 hole when commenced was 10 inches in diameter, but this was found to be too small on account of the frequent caves, and the size of the other holes was increased, the last holes being 18 inch. This allows of casing and reducing six times, or until the hole has been reduced to 5 3-18 inch diameter.

The last year's work has been on the drilling of No. 5 hole. Progress all through has been greatly retarded on account of the many crevices and beds of quicksands met. No. 6 hole is to be located nearer the lake, and it is hoped will encounter a better drilling formation.

### Quarries.

The information in the report is from inspection and from official records.

The quarries are all in good condition, worked systematically and with due regard to safety. There are about 1,400 men employed, not regularly. The output for the year was, gypsum 280,000 tons; building stone 10,690 tons; limestone 473,067 tons; grindstone 400 tons; granite 954 tons.

One fatal accident was reported in the year: Reuben B. Smith, age 50 years, was killed at the Wentworth Gypsum Company's quarry near Windsor. He was caught under a dump car while oiling it. A verdict of accidental death was given by the jury of inquest.

Copies of the Act relating to quarries, and the necessary forms for making returns have been sent to all operators in the province; but it is difficult to get prompt returns.

The principal material quarried is gypsum (sulphate of lime).

Nova Scotia is rich in this mineral, generally of pure quality.

A glance at the geological map, readily shows that the coboniferous system in Nova Scotia, lies in the counties of Cumberland, Colchester, Hants, Pictou, Antigonish, Inverness, Victoria, Cape Breton and Richmond. The carboniferous series is the home of the gypsiferous deposits, and these counties contain immense deposits of gypsum.

In the territory lying between Minudie and Pugwash, there are large deposits, especially at Nappan River, and at Pugwash. In Hants County, it is quarried near Windsor, in the outcrop of an immense vein. It is quarried at Newport, Cheverie, Walton, and Noel, in the same county. In Pictou it is found in workable quantities on the East River. In Antigonish it is exposed, in one place on the coast, for a height of 200 feet. The bed of gypsum from which Plaster Cove, now Port Hastings, took its name, is of enormous thickness, two-thirds of which is anhydrite or hard gypsum.

Near the mouth of Mabou River, there is another immense deposit: a peculiarity about the gypsum in this vicinity is; that it crops alongside the coal, both being in the Lower Carboniferous. It appears again at Cheticamp, and is quarried and manufactured at Eastern Harbour, by the Great Northern Mining and Railway Company.

It lies in many places along the Margaree River, and at Lake Ainslie. It abounds at Big Harbour on the Bras d'Or Lake, and at St. Ann's, where the Victoria Gypsum, Mining and Manufacturing Company is working a large quarry. Another deposit is being worked in Victoria County, at Ottawa Brook, near the Intercolonial Railway.

At Lennox Passage, Isle Madame, in Richmond County, there is a large bed of exeellent quality. In Cape Breton County there are large deposits, but they have not been worked to any great extent.

The surfaces of all these beds of gypsum are marked by inverted cone-shaped cavities, known as plaster pits or kettle holes. In some deposits they are not exposed, save the tops, and gypsum may be traced by these, where there is no outcrop. These cavities are formed, some geologists say, by the solvent action of surface water penetrating the fissures of the gypsum. Other authorities contend that kettle holes are formed by escaping gases. The cavities are more contracted in the anhydrite.

The increase in the production of gypsum is about proportional to the increase in the manufacture of cement: this and the slow increase in the building trades and other purposes for which white gypsum is used, regulate the production. The quantity is, easily, far in excess of the demand for many years to come. The grey and blue varieties are used for cement and for agriculture, and are available for many years.

The output of gypsum in Canada in 1911 was 505.457 tons, valued at $978,863, half of which was produced in this province.

The following is an analysis of gypsum quarried at Eastern Harbour, Inverness County:—

| | % |
|---|---|
| Insoluble residue | .30 |
| Oxide of iron and Alumina | .10 |
| Calcium sulphate | 90.49 |
| Calcium carbonate | 2.01 |
| Magnesium Carbonate | .76 |
| Moisture | 5.70 |
| Undetermined | .64 |
| | 100. |

An analysis of Hants County gypsum shows the following:—

| | |
|---|---|
| Lime | 32.62 |
| Magnesia | tr. |
| Ferric oxide and alumina | .86 |
| Sulphuric Anhydrite | 46.08 |
| Water, loss on ignition | 20.30 |
| Insoluble mineral matter | .14 |
| Carbonic anhydride | tr. |
| | 100. |

Building stone is quarried near Pictou, and at Amherst and Wallace, grindstones are quarried on the west side of Merigomish Harbour, limestone is quarried at Ball's Creek, and at Leitche's Creek in Cape Breton County, dolomite at George's River, Cape Breton County, marble and limestone at Marble Mountain, Inverness County. The output of limestone, dolomite and marble is used in the furnaces of the steel works at Sydney and Sydney Mines.

# MOLYBDENITE DEPOSIT AT TURN BACK LAKE, QUEBEC

By R. O. SWEEZEY, B.Sc.

Molybdenite for some years was known to occur at Turn Back (Keewagama) Lake in Northern Quebec, but it was not until November, 1909, that the writer's attention was attracted by samples of this ore which were shown him by some Indians. A brief examination of the deposits showed their importance and a selection was at once made covering the best showing and 720 acres was staked.

At the present time these properties are most readily reached via Transcontinental Railway from Cochrane, Ont., 140 miles east to Davey Lake, Que., thence by overland road four miles south, thence by canoe a half day's travel to the properties on Indian Peninsula, Turn Back Lake.

To a large extent the surrounding country is covered by dense forest growth and by a heavy clay mantle. The rock formation is Keewatin. On Indian Peninsula the rocks are mostly coarse grained and pegmatite granites, which have intruded through the older schistose Keewatin. Later there were intrusions of large dykes of diabase. These softer Keewatin rocks have been worn down but the granite rocks reach boldly up to a height of about 300 feet above lake level. On the northern part of the peninsula some 30 to 40 quartz veins occupy fissures in the granite and have a bearing roughly northwest. On the two claims situated on the southern part of the peninsula there are about as many more of these quartz veins bearing the same direction.

These veins vary in width from a foot to over 10 feet, with the greater number over three feet wide. The quartz is clear, smokey, and rose tinted. The contact with the granite walls is clearly defined, the quartz breaking away readily.

Greenish white mica is usually present in the walls forming as it were a lubricant at the contacts.

Work has been carried on prospecting these properties during the past three summers with a force of ten to twenty men. Most of this prospecting work was executed on the 440 acres of the properties situated at the north end of the peninsula while the 280 acres on the southern part of the peninsula were only scratched along the lake shore where the outcroppings are more easily worked.

The length of vein matter uncovered and traced on the north claims aggregated over 16,000 feet. One of these veins was traced for 2,000 feet without a break, while indications leave no doubt as to its length being at least 2,600 feet. Several veins have been traced for over 500 feet in length.

The molybdenite occurs in these quartz veins usually associated with mica and in most cases concentrated at the walls of the veins and within a width of six inches or a foot on each wall, but within the quartz matter. In a few cases though the molybdenite has entered the granite walls to a depth of a few inches. Bismuthenite occurs in some of the veins associated with the molybdenite but usually it is found in isolated long needle-shaped crystals in the quartz and removed from the walls.

By rejecting the central part of the quartz veins there would be practically no loss of molybdenite. The richest veins of molybdenite ore bodies have been found on the eastern side of the north properties where the contact of granite and Keewatin schist is located. Along this contact which is traceable for over 1,500 feet on the properties there are three or four veins three to eight feet wide which have been broken here and there by the irregularity of the contact, but are traceable for lengths of 500 feet and over. One of these veins especially, which has been traced and uncovered for a length of 450 feet, seems to lose its identity as a true fissure vein and becomes a filling between the granite and schist following the irregularities of the contact. This quartz filling has been trenched across in a couple of places, and in one trench 15 feet deep where the quartz mass is eight feet wide an average sample selected with care throughout the whole mass in the walls of the pit, by Dr. T. L. Walker, of the University of Toronto, gave an assay of 6.4% molybdenite. Several other average samples were taken along this same ore body and gave assays of from 2.17 to 2.3 per cent. molybdenite. This vein has not been thoroughly explored, and only in one place has a depth of 15 feet been reached.

Owing to the tendency for molybdenite to weather and oxidize, all the veins appear lean on the surface, and especially on account of the concentration of ore at the contact walls it is necessary to get down some three or four feet in the veins in order to get below the effects of weathering and oxidization caused by the percolating of water or subsequent freezing in the seams at the contact between quartz and country rock.

In sampling in some fifteen different pits throughout the north claims with a view to ascertaining the average ore contents, Dr. Walker found the average assay of 1.92 $MoS^2$. This takes into account the whole of the vein matter, fully one-third of which would be rejected as barren and the other two-thirds of the quartz mass cobbed to one-half its bulk for crushing and concentrating.

There are portions of a few feet in the lengths of the veins which might be totally rejected in mining, but this would probably more than be made up for in other portions of the vein where the ore concentration would average about 6% of the vein matter. Several tons of ore have been taken out from these properties from time to time and concentration tests were made by Prof. J. C. Gwillim at the School of Mining, Kingston, by the Elmore Vacuum Process at Denver and by the Henry E. Wood Ore Treating Co., Denver. All of these tests were satisfactory though certain difficulties were met with. As a result it was found that a very successful and efficient concentration may be employed by a combination of parts of the three methods used in the tests.

The St. Maurice Syndicate of Quebec owns these molybdenite claims and has carried on the development and prospecting work on the properties. No attempt has been made to sink shafts to any depth beyond 20 to 25 feet, the main object being chiefly to prove continuity of surface extent of vein matter within an economically workable area.

The reports of their consulting engineers show that the results of the work carried on are very satisfactory and presuming a reasonable continuity in depth of the veins with the same percentages of ore as found on surface sampling these properties should certainly become very important producers of molybdenite.

# PERSONAL AND GENERAL

Dr. Milton L. Hersey, of Montreal, left last week on a visit to California.

Mr. John E. Hardman has returned to Montreal from an absence of nearly three months in Mexico, where he was engaged in examining tin properties.

Mr. M. E. Purcell, chairman of the Western Branch of the Canadian Mining Institute, and who represented the branch at the recent annual meeting of the Institute in Otawa, returns to Rossland this week.

Mr. H. P. De Pencier has accepted an appointment to engage in consulting work with Mr. W. Mein.

Mr. Charles A. Banks, a mining engineer from New Zealand, who in the latter part of 1912 took charge of Jewel gold-mine and stamp-mill, and did mining and milling for two or three months, has left the Boundary district, British Columbia, in which the property is for England. A local newspaper states that he has gone to confer with the directors of the Jewel Syndicate relative to the substitution of a more effective process for treating the slimes than that with which the mill is now provided.

Mr. T. Walter Beam, of Denver, Colorado, who had much to do with the purchase of the Nickel Plate group of mines and 40-stamp mill in Hedley camp, Similkameen district, B.C., by those who organized the Hedley Gold Mining Company, has again been spending a few weeks in British Columbia.

Mr. Hermann Bellinger, general manager of the Great Cobar, Limited, was in San Francisco in February on his way from New South Wales to England.

Mr. C. Victor Brennan, chief mining engineer for the Utah Consolidator Co., has returned to Bingham, Utah, after a honeymoon trip from British Columbia to Southern California and thence to Salt Lake City, Utah.

Mr. C. M. Campbell, superintendent of the Granby Consolidated Co.'s big copper mines in Boundary district, British Columbia, has returned to his headquarters at Phoenix, after a wedding trip that extended over several weeks.

Mr. Lorne A. Campbell, general manager of the West Kootenay Power and Light Co., who is member for Rossland constituency in the Legislature Assembly of British Columbia, recently gave the local parliament some interesting and instructive information relative to the mining industry of Rossland camp (which to date has produced metals to an aggregate gross value of between $55,000,000 and $60,000,000). Mr. Campbell took advantage of the opportunity afforded him, when participating in the debate on the Provincial Budget, to show that the future of Rossland's chief mines is as promising as the past has been prolific in good results.

Mr. Herbert Carmichael who, at the end of 1912 voluntarily retired from the position of Provincial Assayer in British Columbia after more than twenty years' efficient service in that office, left Victoria on March 2 for England, intending to be absent from the Province three or four months.

Mr. W. G. Clark, who last October was one of the victims of an accidental explosion in the low-level adit of the Payne mine, Slocan, B.C., the work of driving which he was superintending, has returned to Sandon after having been several months in Vancouver under surgical treatment. One of his eyes was saved, but he has lost the other.

Mr. C. L. Copp, manager for the Coronation Mines, Ltd., of Victoria, B.C., has returned to the company's mine on Cadwallader creek, Bridge river, Lilloet district, B.C., to continue development work, with the main object of opening a sufficient number of faces of ore in the Coronation mine to allow of an adequate supply being maintained to keep the 10-stamp mill running continuously crushing ore. The mill is to be started next summer. Large samples of quartz sent to the company's office in Victoria, stated to be fairly representative of the first-class ore available, look promising for yielding payable gold returns.

Mr. A. W. Davis, of the Consolidated Mining and Smelting Co.'s mining engineering staff, has taken charge at the company's No. 7 mine, in Boundary district, where ore-production has been resumed after several months of inactivity at this one of the company's several mines.

Mr. Geo. Watkin Evans, coal geologist and mining engineer, of Seattle, Washington, has disclaimed, through the medium of the Victoria Times, any association with a Mr. Grossman in the examination of the coal property of the British Columbia Anthracite Coal Co., Ltd., he having made an independent examination of, and confidential report on, that company's coal lands in northern Skeena. Like many "hot-air artists," Mr. Grossman seems to have made use of the name of Mr. Evans and Mr. G. S. Malloch, of the Geological Survey of Canada, without the knowledge or consent of those gentlemen. There must surely be lots of gas obtainable from some of the northern Skeena and Graham Island coals, if one may judge by the published allegations of several of those who claim to know all about them.

Mr. Colin Fraser, who spent several months examining mining properties in Ontario and British Columbia, arrived in London several weeks ago on his return from Canada.

Mr. J. A. Fraser, member for Cariboo district in the British Columbia Legislature, recently gave his fellow-members in the local House some valuable information about the enormous mineral resources of the large area of territory contained within the boundaries of the electoral district he represents. Now that railway transportation facilities are being provided, it is expected these resources, heretofore largely neglected by reason of their remoteness from transportation, will be utilized in steadily increasing degree.

Mr. Robert R. Hedley, of Vancouver, B.C., expects to spend the month of March on the Queen Charlotte islands, whence he went early in the month.

Mr. C. P. Hill, of Montreal, actively interested in coal-mining enterprises in Alberta and British Columbia, was out West in February.

Mr. Joseph G. S. Hudson, of the Explosives section of the Mines Branch, Canada Department of Mines, went to Naimo, Vancouver island, B. C., in February, to be present at an official inquiry into the circumstances connected with the utter destruction of the steamer Oscar by an explosion of a cargo of dynamite she was carrying. Incidentally, much damage was done to colliery headworks on Protection island, and to buildings in the city of Nanaimo, this having resulted in considerable loss to the respective owners.

Mr. J. F. Menzies, of Roslyn, general superintendent for the Northwestern Improvement Co., of Tacoma, Washington, probably the largest owner of coal-mines in that state, on the invitation of the Western Branch of the Canadian Mining Institute, kindly consented to attend the fourteenth general meeting, convened to be opened at Naimo, B. C., on March 4, and deliver an address on mine-rescue matters. Mr. Menzies has taken great interest in first-aid and mine-rescue training and is fully informed on these subjects.

Dr. E. B. Milward, F.G.S., has for a year or more been resident in West Kootenay district of British Columbia, where he has been giving attention to the occurrences of mineral in parts of that large mining area. For years he was connected with the Bewick-Moreing firm of mining engineers, and in their interests visited various parts of the British Empire and other countries.

# ECHOES FROM THE MEETING.

Messrs. F. H. Sexton, A. C. Ross, and C. L. Cantley were representative Nova Scotians present.

While some familiar faces fro mthe United States were missing, the meetings were graced by Dr. James Douglas, Mr. W. R. Ingalls, Dr. Heinrich Ries, Mr. R. V. Norris, Mr. G. M. Colvocoresses, and others.

No master of ceremonies ever excelled Colonel J. J. Penhale. His mirthful dignity, his calm resourcefulness, his unbending tyranny, make him a marked man.

Past President Geo. R. Smith was called hastily away on business.

Mr. Neil Macdonald was among the missing. Both the applause and the Cobalt contingent suffered from his absence.

The deadly drops dealt out behind the stage-bar had such immediate effect as to endanger the dramatic unities.

Barring the fact that he called us the Canadian Mining Association, the Governor-General made no lapse. This is a constructive compliment to all concerned.

The officials of the Chateau Laurier were attentive, tolerant, and courteous.

The Cobalt contingent preserved all its traditions. Individually and collectively that contingent is a credit to its native lair. Would that all our mining camps were as loyal to the Institute!

Mr. Haultain's paper rang in pleasant change in the programme. The audience filled the room and overflowed into the corridor.

Major Leckie, brisk and cheerful as ever, took part in the proceedings throughout. Much missed was his side partner, Col. A. M. Hay.

Dr. J. A. Dresser is coming in to his own as a genuine humourist. He was one of the lights of the occasion.

Markedly in contrast were the speeches of the Premier and of Sir Wilfrid at the dinner. The former, impressive, thoughtful, dignified, and incisive, wields the intellectual sabre; the latter, elusive, rapid, graceful, chooses the rapier.

Sir James Grant was by no means least amongst the after-dinner speakers. He was listened to, as he always will be, with respect and sympathy.

The friends and adversaries—both included in the term "friends"—of Mr. Eugene Coste, sincerely regretteed his absence. With most of us Mr. Coste has become a habit.

As assured by Mr. G. C. Mackenzie, the members who failed to secure free trips on the Ottawa street cars, could obtain vouchers, and, later, refunds. The company will not go into liquidation.

**C. M. I. Group in front of Chateau Laurier, Ottawa.**

# SPECIAL CORRESPONDENCE

## ONTARIO.

**Cobalt, South Lorrain, Elk Lake and Gowganda.**—According to figures prepared by Mr. John McLeish of the Mines Department at Ottawa, the production for the province showed a falling off of 627,334 ounces in silver ounces. The production from the Cobalt camp showed a falling off of a million and a half ounces and a gain in value of a million and a half dollars. The increase in value for the province was about 12 per cent.

The Anglicization of the Cobalt camp continues. At a general meeting of the City of Cobalt mining company it was decided to accept the offer of an English syndicate for the sale of the property at 52½ cents a share. This would amount to about $750,000.

At the annual meeting of the Cobalt Lake mining company 90 per cent. of the stock was already in the hands of the English syndicate identified with the Cobalt Townsite mining company. The Chambers Ferland and the Silver Queen are in the hands of the Cobalt Aladdin and some tempting offers have been made to several companes with mines that have produced and are producing. That there will be more sales there is little doubt.

Development along the Cobalt Lake fault is attracting very general attention in the camp. The Cobalt Lake is finding rich shots of ore along the fault, but there is no continuity of ore body. So far development along the fault has revealed wide and sometimes rich ore shoots with intervening patches of barren ground. Development along the fault is, however, very inexpensive, one drill on the McKinley-Darragh making from 40 to 45 feet a week. At the north end of the lake the La Rose is now conducting some very interesting exploration on work with a view to opening the fault at lower levels. At one level the vein was cut showing over a foot of solid calcite, and now it will be intersected at a lower level. The Right of Way is also sinking to develop along it and on the Cobalt Lake several good and wide ore bodies have been opened up on it. The McKinley-Darragh has 1,200 feet of it on their property. They have lately been developing along the fault at the 250 foot level, where some rich ore has been struck. Beyond them again the Princess has struck four inches of cobalt in the fault at the 200 foot level. J. B. 2, which is all the Little Nipissing now has in the camp, has suddenly taken on value because the fault runs across it. Beyond it again the Hudson Bay is pushing a cross cut from the bottom of a 100 foot shaft in order to see what there is along the fault on their property. In a few months' time there will be some very valuable data on the subject.

The production at the McKinley-Darragh for the month of February was approximately the same as for January, namely, 180,000 ounces. This is lower than last year by reason of the fact that development is being retarded as much as possible at the Savage, where every ton of rock thrown on the dump will have to be re-handled at additional cost. The Savage addition to the McKinley mill will not be running till the end of April or May, when all Savage ore will pass over the aerial tramway to it. Intensive development on the McKinley is still producing good results. On vein 36 a shoot of ore 100 feet long has been opened up, and there is width of about twelve feet of milling ore. On the second swamp vein the top of an old stope is yielding unexpected good results, several rich stringers in a body of fair milling ore giving good tonnage. The McKinley-Darragh will pay its usual 10 per cent. quarterly on April 1, which will raise the record of that company to 156 per cent. and a gross total returned to shoreholders of $3,505,175.

Development on the old King Edward property at Cross Lake under the management of the York Ontario continues to be very interesting. When the Silver Cliff mine was closed down about two years ago it was concluded that silver in the diabase in this particular section of the camp was not worth mining. Now both the King Edward and the Silver Cliff have been reopened. The York Ontario, which obtained a lease on the old mine at very favourable terms, is mining the property most economically. Silver has been discovered, both in the wall rock and as vein matter in nearly every point where a drill has run, and there is already a good body of ore ready for the bumping tables now being installed in the old compressor house. As the City of Cobalt will undoubtedly make new arrangements for milling in the near future the little stamp mill will probably be available for the York Ontario in a few months. Everywhere in the mine it was discovered that a little development opened up ore. Whether this is worth mining is yet to be demonstrated, but there is certainly plenty of it. Very interesting, too, is the diamond drilling on the property. The drill has now been put down 600 feet below the adit level and the cores still show that the bottom of the diabase sill has not been reached. The management want to see what chances there is of picking up ore along the contact.

At the Silver Cliff Mr. W. H. Jeffery is in charge for Mr. Wigmore of Toronto, who has purchased the property on what appears to be easy terms. The old workings have already been pumped out and a gang set to work to clean up. No time will be lost in resuming development. On one of the old Prince properties adoining the King Edward some development is being attempted by a leasing syndicate. This property has never received much development. In 1906 the Mackenzie and Mann interests had an option on it for a big figure. They did some diamond drilling and sank a shaft, but discovered nothing which would justify the payment of the first big instalment of the purchase price. Since then it has lain idle. There is scarcely an old prospect in camp that is not been looked over and examined mainly, it is probable, for exploitation on the London market, though there is a demand for properties in the best parts of Coleman all over the country again.

Figures compiled by Mr. A. A. Cole show that there was a big increase in the tonnage of ore milled last year. The total tonnage rose from 329,462 in 1911 to 455,516 in 1912. Every mill in camp was busy with the exception of the Silver Cliff, and it is being reopened this spring. At the McKinley-Darragh, Beaver, Cobalt Lake and Casey additions are being made to existing plants which will raise the tonnage again for 1913. The Nipissing, Buffalo, Dominion, Reduction, Campbell and Deyells and the O'Brien are shipping concentrates, the other companies operating mills concentrates. There is now no mine in camp making regular shipments of low-grade ore and only three or four despatching it at all.

**Porcupine, Swastika and Larder Lake.**—So satisfactory has been the development of the ore body on the 260 foot level of the Golden Stairway ore body of the Dome that it has been definitely determined to make an addition of forty or sixty stamps to the present mill. Until further drifting has been done the determination for the smaller or the larger number of stamps will not be made. Whilst it has been generally understood that the forty stamps at the Dome would be duplicated this year, nothing definite had been stated.

On the first of March the Dome mill will be treating 450 tons per day. On this basis, with the addition of 40 stamps, the capacity will be raised to 900 tons per day, or, with 60 stamps, to 1,125 tons every 24 hours. At the present time all ore for the mill is coming from the glory holes on the Dome ore body. For the past nine months the mill has been running on a basis of 10,000 tons per month, and this is all coming from above the 100 foot level of this big ore body, where it is estimated there are yet between seven and eight years' reserves of ore, computing the capacity of the mill at its old level. As one drill can break down 75 tons per day into the shoots, the mining is necessarily the most economical.

The Dome is now running with electric power from Waiwaiten Falls. The coal bills has been for some time the feature in the cost which the management most desired to prune, and it will now be eliminated for all but heating purposes.

The new McIntyre mill is now running. The management was so anxious to get it started that they did not wait for the arrival of the agitating tanks, and they will be installed later. Ore will be fed to the mill from the 300 foot levels of No. 4 and No. 1 shaft, while the original mill will be kept going from the glory hole at the No. 1 shaft, where there is still much free milling ore at the upper levels. The capacity of the new plant is stated at 150 tons.

With the payment of the fifth dividend from the Hollinger goes a statement showing that the property is in a very healthy condition indeed. Production jumped in January from 1,373 tons, gross value $25.-

687, to 2,122 tons per week, gross value $59,313. Since the last report was issued the production has again been raised, so that it is now between $70,000 and $75,000 per week, or very considerably more than half as much again as for the whole of the gold production of Ontario for the year 1911.

General Manager Robbins reports "a steady improvement in values and tonnage will be noted. The relative decrease for the week ending January 28 was due to shutting down portions of the mill for much-needed repairs. Mr. Robbins also reports that development was, when the report was issued, along a lean streak in the main vein at the 300 foot level. This was anticipated, as the same conditions occur at all the upper levels.

Strike conditions in Porcupine are almost at an end. Most mines wanting to resume work have resumed and more will in a few days. The clearing of the air at Cobalt has relieved the stress all through Northern Ontario.

Operations at Larder Lake are largely confined to the Goldfields, Limited. A very valuable electric power plant has been erected at Raven Falls and is now running all the machinery at the mine. The power rights are capable of developing 10,000 horse power if it is ever required.

According to an official statement, "the ore body has been opened up for 130 feet in width and 600 in length and there are eight drills at work. Thirty stamps are dropping on ore.

# STATISTICS AND RETURNS

## DOMINION IRON AND STEEL. FEBRUARY OUTPUT.

The output at the plant of the Dominion Iron and Steel Co. for the month of February was as follows: Pig iron, 700; ingots, 22,560; blooms, 19,900; rails, 12,745; total shipments, 19,470. The February output of the Dominion Coal Co. was 336,000 tons.

## SCOTIA FEBRUARY OUTPUT.

For the past month Nova Scotia steel and coal outputs were as follows: Coal mined, 59,704 tons; pig iron made, 5,495; steel ingots, 4,828; ore mined, 79,535 tons; February being a short month.

## COBALT ORE SHIPMENTS.

Of the half million pounds of ore shipped out last week almost half was low grade. The Bailey Cobalt also sent out a car of ore running less than 500 ounces to the ton.

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 921.98 | $54,587.97 |
| Buffalo | 28,338.00 | 17,000.00 |
| Kerr Lake | 1,500.00 | 900.00 |
| | 122,359.98 | $72,487.97 |

The shipments for the year to date are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Townsite | 12 | | 426.68 |
| Crown Reserve | 1 | | 146.47 |
| McKinley-Darragh | 12 | | 436.36 |
| Peterson Lake | 1 | 2 | 115.96 |
| Wettlaufer | 1 | | 60.00 |

The shipments for the week ending March 8th in pounds are:

| Mine. | High. | Low. | Lbs. |
|---|---|---|---|
| Crown Reserve | 1 | | 60,162 |
| Coniagas | 3 | | 160,501 |
| Trethewey | 2 | | 83,600 |
| Bailey Cobalt | | 1 | 46,500 |
| Nipissing | | 3 | 211,005 |
| La Rose | 2 | | 35,776 |
| Cobalt Townsite | 2 | | 142,000 |
| | 10 | 4 | 539,544 |

The bullion shipments for the week were:

| | | | |
|---|---|---|---|
| Temiskaming | 5 | 1 | 168.85 |
| Beaver | 3 | | 78.10 |
| Kerr Lake | 3 | | 120.17 |
| Coniagas | 10 | | 362.86 |
| Trethewey | 6 | | 158.73 |
| Drummond | 5 | | 6,127.83 |
| Cobalt Lake | 4 | | 173.32 |
| Nipissing | | 9 | 306.29 |
| La Rose | 15 | | 538.86 |
| Hudson Bay | 4 | | 125.35 |
| Colonial | 1 | | 21.56 |
| Chambers-Ferland | 1 | 2 | 95.20 |
| O'Brien | 2 | | 87.41 |
| Dominion Reduction | 1 | | 85.80 |
| Bailey | | 1 | 23.25 |
| City of Cobalt | 1 | | 32.94 |
| Green-Meehan | 1 | | 12.96 |
| Casey Cobalt | 2 | | 59.32 |
| | 92 | 15 | 3,764.26 |

The bullion shipments to date are:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 878,000.20 | $484,626.22 |
| Buffalo | 258,867.00 | 162,100.00 |
| Dominion Reduction | 79,200.00 | 45,405.00 |
| O'Brien | 21,058.00 | 13,038.00 |
| Crown Reserve | 15,691.00 | 9,354.00 |
| Trethewey | 5,077.00 | 3,223.00 |
| Townsite | 6,770.00 | 4,209.00 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Miscellaneous | 7,643.00 | 4,575.00 |
| Kerr Lake | 1,500.00 | 900.00 |
| | 1,276,600.00 | $686,935.22 |

## B. C. ORE SHIPMENTS.

### Week ending March 1st.

With last week's ore production the total in the Kootenay and Boundary district for the year to date reached the substantial figure of 407,232 tons, which is considerably above the average of 1912. Boundary ore output last week was 38,600 tons, which sent the total for the first nine weeks of 1913 flying past the 300,000 ton mark.

Receipts at the Consolidated Mining & Smelting Company's plant at Trail continued heavy and reached nearly 8,000 tons.

In the Nelson district the heaviest shipper was the H. B. at Deer Creek, in the Sheep Creek camp, which sent 326 tons to Trail smelter. The Queen Victoria shipped 300 tons to the British Columbia Copper Company's smelter at Greenwood.

Ore production for the week in the Kootenay and Boundary districts was 51,013 tons. Smelter receipts for the week were 45,013 tons and for the year to date 353,895 tons. Production in detail was:

### Granby Smelter Receipts.

Grand Forks, B.C.

| | Week. | Year. |
|---|---|---|
| Granby | 23,683 | 188,048 |

### Consolidated Co.'s Receipts.

Trail, B.C.

| | | |
|---|---|---|
| Ben Hur | 124 | 1,229 |
| United Copper | 95 | 796 |
| No. 7 | 28 | 416 |
| Standard | 348 | 2,555 |
| Bluebell | 248 | 1,708 |
| Hope | 56 | 146 |
| Yankee Girl | 128 | 923 |
| H. B. | 326 | 1,714 |
| Emerald | 31 | 372 |
| Granite-Poorman | 32 | 65 |
| Second Relief | 44 | 44 |
| Centre Star | 3,768 | 23,918 |
| Le Roi | 1,069 | 11,006 |
| Le Roi No. 2 | 648 | 4,021 |
| Sullivan | 782 | 6,720 |
| St. Eugene | 130 | 333 |
| Other mines | ... | 2,991 |
| Total | 7,857 | 58,957 |

### B. C. Copper Co.'s Receipts.

Greenwood, B.C

| | | |
|---|---|---|
| Mother Lode | 6,210 | 53,639 |
| Rawhide | 6,083 | 41,893 |
| Napoleon | 820 | 6,069 |
| Unnamed | 60 | 667 |
| Queen Victoria | 300 | 4,622 |
| Total | 13,473 | 106,890 |

### East Kootenay.

| | | |
|---|---|---|
| Sullivan | 782 | 6,720 |
| St. Eugene | 130 | 333 |
| Total | 912 | 7,050 |

### Rossland.

| | | |
|---|---|---|
| Centre Star | 3,768 | 23,918 |
| Le Roi | 1,069 | 11,006 |
| Le Roi No. 2 | 648 | 4,021 |
| Le Roi No. 2, milled | 350 | 3,150 |
| Other mines | ... | 132 |
| Total | 5,835 | 42,227 |

### Boundary.

| | | |
|---|---|---|
| Granby | 23,683 | 188,048 |
| Mother Lode | 6,210 | 53,639 |
| Rawhide | 6,083 | 41,893 |
| Napoleon | 820 | 6,069 |
| Unnamed | 60 | 667 |
| Ben Hur | 124 | 1,229 |
| United Copper | 95 | 796 |
| No. 7 | 28 | 416 |
| Nickel plate, milled | 1,500 | 13,500 |
| Other mines | ... | 2,393 |
| Total | 38,603 | 308,850 |

### Nelson.

| | | |
|---|---|---|
| Queen Victoria | 300 | 4,622 |
| Yankee Girl | 128 | 923 |
| H. B. | 326 | 1,714 |
| Emerald | 31 | 372 |
| Granite-Poorman | 32 | 65 |
| Second Relief | 44 | 44 |
| Mother Lode, milled | 500 | 4,500 |
| Granite-Poorman, milled | 250 | 2,250 |
| Second Relief, milled | 200 | 1,800 |
| Other mines | ... | 3,486 |
| Total | 1,811 | 19,776 |

### Slocan and Ainsworth.

| | | |
|---|---|---|
| Standard | 348 | 2,555 |
| Bluebell | 248 | 1,708 |
| Hope | 56 | 146 |
| Standard, milled | 500 | 4,500 |
| Bluebell, milled | 1,200 | 10,800 |
| Van-Roi, milled | 1,100 | 8,800 |
| Kilo, milled | 100 | 900 |
| Rambler-Cariboo, milled | 300 | 2,700 |
| Other mines | ... | 1,547 |
| Total | 3,852 | 21,656 |

### Lardeau.

| | | |
|---|---|---|
| Other mines | ... | 137 |

## GENERAL MARKETS.

Coal, anthracite, \$5.50 to \$6.75.

Coal, bituminous, \$3.50 to \$4.50 for 1¼ inch lump.

### Coke.

March 10.—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$2.50 per ton.

Foundry coke, prompt, \$3.00 to \$3.25 per ton.

March 10.—Tin, Straits, 46.40 cents.

Copper, prime lake, 14.90 to 15.00 cents.

Electrolytic copper, 14.82½ to 14.92½ cents.

Copper wire, 16.00 to 16.25 cents.

Lead, 4.35 to 4.40 cents.

Spelter, 6.40 to 6.50 cents.

Sheet zinc (f.o.b. smelter), 8.25 cents.

Aluminium, 26.50 to 26.75 cents.

Nickel, 40.00 to 45.00 cents.

Platinum, ordinary, \$46.00 per ounce.

Platinum, hard, \$51.00 per ounce.

Bismuth, \$2.00 to \$2.25 per lb.

Quicksilver, \$40.00 per 75-lb. flask.

## SILVER PRICES.

| | New York. cents. | London. pence. |
|---|---|---|
| Feb. 22 | .. | 28 5/16 |
| " 24 | 61 | 28 1/16 |
| " 25 | 60¾ | 27 15/16 |
| " 26 | 60½ | 27 13/16 |
| " 27 | 60 | 27⅝ |
| " 28 | 58⅞ | 27 1/16 |
| Mar. 1. | 59⅛ | 27 3/16 |
| " 3. | 59⅝ | 29 7/16 |
| " 4 | 59⅝ | 27 7/16 |
| " 5 | 59⅝ | 27 7/16 |
| " 6 | 59⅜ | 27 5/16 |
| " 7 | 58⅝ | 26 15/16 |
| " 8 | 58¾ | 27 |
| " 10 | 58¾ | 27 |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye.- Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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**Quebec**

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Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Obalski & Dulieux
Ross, J. G.
Woolsey, W. J.

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**FOREIGN-New York**

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## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

)85. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

1218. Summary Report of the Geological Survey for 1911.

NEW BRUNSWICK and NOVA SCOTIA

.113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

ONTARIO

1213 Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

BRITISH COLUMBIA

940. Report on Graham Island, B.C., by R. W. Ells. (Reprint.)

1121. Memoir No. 13. Southern Vancouver Island, by Charles H. Clapp.

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON and NORTH WEST TERRITORIES

080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

### MAPS RECENTLY ISSUED:

CANADA

)42. Mineral Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA

133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmorland Counties, N.B. Geology and topography. Scale 1 mile to 1 inch.

QUEBEC

1112. Map 12A. Vicinity of the Tranco ntinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

ONTARIO

964. Geological map of portions of the districts of Algoma and Thunder Bay, Ontario. Scale 8 miles to 1 inch. Second edition.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.

1167. Map 29A. Mother Lode and Sunset Mines, Deadwood, B.C., Topographical. Scale 400 feet to 1 inch.

1147. Map 19A. Lardeau, West Kootenay, B.C. Topographical scale 4 miles to 1 inch. Contour interval 500 feet.

1197. Map 47A. Law's Mining Camp near Tulameen, B.C. Geological. Scale 600 feet to 1 inch. Contour interval 50 feet.

1219. Map 54A. Nanaimo Coal Area, Vancouver Island, B.C. Scale 1½ miles to 1 inch. Contour interval 100 feet.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

# BUYERS AND SELLERS OF METALS

# ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

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Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

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**Castings—**
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
C. O. Bartlett & Snow Co.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Crushers—**
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co, Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Rock Drill—**
Cleveland Pneumatic Tool Co. of Canada Ltd.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co, Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co. Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonsan Iron Works, Ltd.

**Excavators.**
Jeffrey Mrg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

**Continued on page 36.**

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

**Girders—Steel—**
Dominion Bridge Co.

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

**Injectors—**
Mussens, Limited.
Peacock Bros.

**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersol-Rand Co., Ltd.

**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.

**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.

**Lights—Mine Bldg—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Link Belt—**
Watrous Engine Works.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Nickel—**
Can. Copper Co.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.

**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.

**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

**Pneumatic Tools.**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Electric—**
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Pneumatic—**
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
E. Leonard & Sons.

**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersol-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

**Pumps—Turbine—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Vacuum—**
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Rolling Mill Machinery—**
Peacock Brothers.

**Rolls—Crushing—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.
Allis-Chalmers-Bullock.

**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Separators—Magnetic—**
American Grondal Co.
Wetherill Magnetic Separating Co.

**Shovels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

**Smelting Machinery—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
Consolidated Mining & Smelting Co.

**Stamp Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Canadian Ingersol-Rand Co., Ltd.
Peacock Bros.

**Steel—Manganese—Castings—**
Peacock Bros.
Hadfield's Steel Foundry Co.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
N. S. Steel & Coal Co.

**Steel—Structural—**
Dominion Bridge Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.
John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Transformers—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

**Tube Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Turbines—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Robb Engineering Co., Ltd.

**Water Wheels—**
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

**Wheels—**
Mussens, Limited.
Jeffrey Mfg. Co.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.

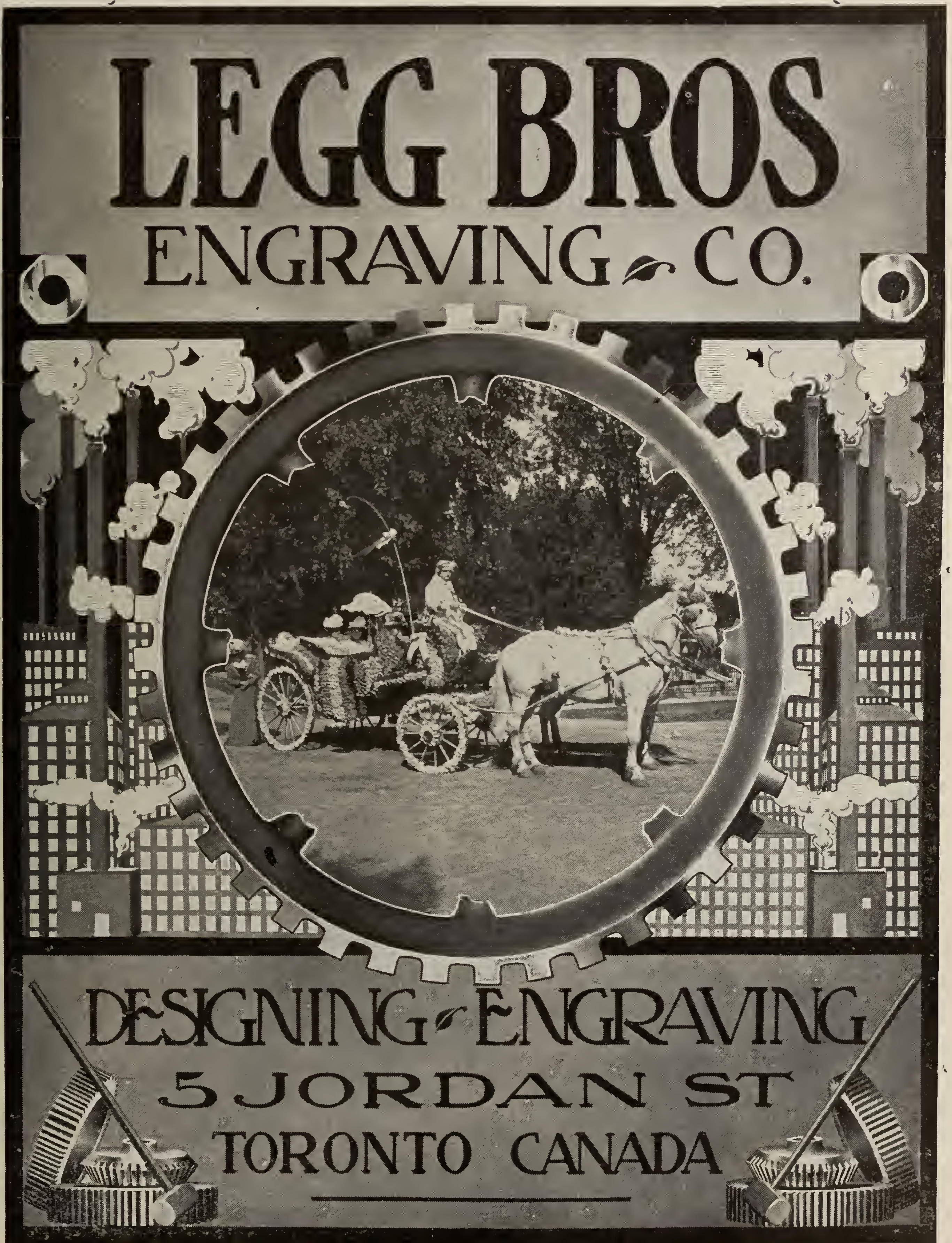
**Wire Cloth—**
Mussens, Limited.
B. Greening Wire Co.

**Wire (Bare and Insulated,**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
**Roessler & Hasslacher.**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# THE CAMERON

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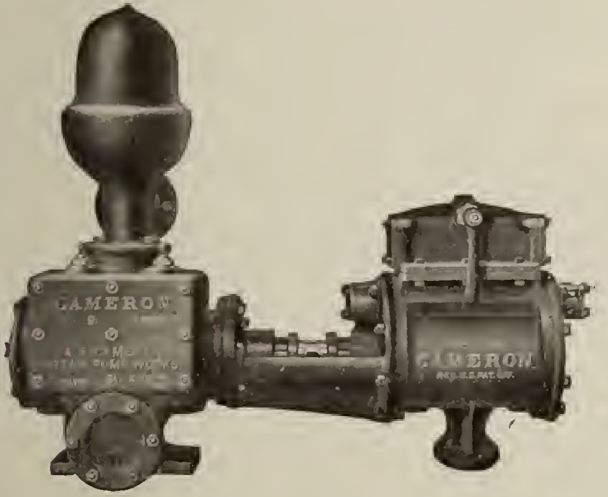


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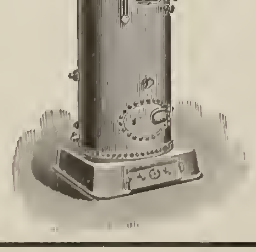

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# THE CANADIAN MINING JOURNAL

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CONTENTS.



## PYRITES IN CANADA

The chief advertisements that the mineral industries of Canada have received have been derived from the exploitation of rich gold and silver deposits. While both Canadian asbestos and Canadian nickel occupy unique positions, yet neither has been the source of very much popular excitement.

It is not desirable that any branch of the mining industry in Canada should have to live down a period of foolish flotations and of disproportionate expansion. For many years the mining of iron pyrites has been going on quietly in Canada. The world's production of iron pyrites is about 2,000,000 tons. Canada's production is, roughly, 100,000 tons per year. In the United States not more than 300,000 long tons are produced. The United States, however, imports practically three-quarters of a million tons from Spain, and is, also, the chief market for the Canadian mineral. For instance, one-third of the pyrites produced in Canada is shipped to the United States.

Within easy reach of the Canadian producer there are at least twenty large firms that are posisble purchasers of the Canadian product. In Canada itself there are five corporations manufacturing sulphuric acid. The market for acid is growing at a rate far greater than is the mining of iron pyrites.

The whole situation as regards Canada has been carefully investigated and fully reported upon in the latest monograph of the Mines Branch, Department of Mines, Ottawa. Dr. Alfred W. G. Wilson, Chief of the Metal Mines Division of the Branch, is the author of that monograph. It is entitled "Pyrites in Canada, Its Occurrence, Exploitation, Dressing and Uses." It is a well-printed, carefully illustrated volume of more than 200 pages.

Dr. Wilson approaches his subject after he has, evidently, been fully seized of its commercial meaning. The uses of sulphuric acid are numerous. The reduction of silver ores and the refining of petroleum are two of the largest channels. Both are of primary importance. Either could form the basis of a substantial iron pyrites enterprise, where the pyrites was being used for the production of sulphuric acid.

But, more important than either of these two uses are the possibilities held out by the paper manufacturing trade. In Europe the pulp mills that use the sulphite process use also iron pyrites as the source of their sulphur. This is not the case in Canada. Imported crude sulphur is used here. Yet it is commercially feasible, and most probably it would be commercially profitable to use pyrites in lieu of sulphur. Not only would this save all the complications of international carriage, but it would also make it possible for each manufacturer of pulp to secure and control his own supply of sulphur. Since Canada is becoming the largest supplier of pulp, the importance of her iron pyrites bodies is obvious.

## GOVERNMENT CORE DRILLING IN NOVA SCOTIA

Encouragement vouchsafed to miners by governments takes various forms. Not the least interesting is that of assisting the prospector in drilling his property. In this direction the Government of Nova Scotia has been particularly active.

The Nova Scotia Department of Mines operates seven prospecting drills of the following general description: Two diamond drills actuated by steam, making cores of two and one and one-tenth inches diameter respectively; two hand diamond drills yielding cores of the smaller diameter mentioned; two steam calyx drills making a six-inch core, and one smaller calyx drill.

Upon the filing of a small bond and of a certified cheque for $250, any available drill is placed at the disposal of the applicant. The drill is then sent to the desired place and is operated under the direction of a person responsible to the Department. The location of the holes is left to the discretion of the applicant; all other matters are controlled by the Department employee.

All expenses, including shipment from and to the place of storing, are charged to the applicant, and, in no wise does the Department hold itself responsible for the manner in which drilling is performed. However, the applicant is given every reasonable consideration. He can make formal complaint at any time and can be sure of a hearing. Copies of the drilling log are filed at the Commissioner's office and similar copies are given to the applicant.

In the year ending September 31st, 1912, 77 holes were bored, at total footage of 10,826 feet. The cost per foot ranged from very low figures up to $2.46 per foot. In a future issue we shall analyze these costs. Meanwhile it may be pointed out that this kind of assistance to the prospector and miner is practical and sane.

## THE ALBERTAN MINES BILL

In the course of the debate on the Mines Bill, now under discussion by the legislative body of Alberta, Mr. J. L. Cote, the member for Athabasca, made a strong plea for the establishment of a Provincial Bureau of Mines, with headquarters at Edmonton. Such a step, while commendable from every standpoint, may meet with objection on the ore score that the Dominion Government, having reserved the rights in the natural resources of the Province, the latter derives no direct revenue from its mines. Mr. Cote affirms, however, that the Province is entitled to the royalties on all coal mined under "road allowances," and this, he stated, would represent an annual revenue of not less than $100,000—a sum quite sufficient to maintain an efficient Provincial Bureau of Mines. Whether or not this contention is correct, it would still seem that any reasonable expenditure by the Province to establish and support such a department, would be thoroughly justified. In Alberta, agriculture is, of course, the principal industry, the total value of the production last year having been $38,400,000. Mining, however, comes second. The value of the coal production alone in 1912 was approximately $8,000,000. The production of cement represented at least $1,000,000, while there was a considerable production of lime, of brick and other clay products. These industries are developing at a very rapid rate; while in the utilization of non-metallic substances, at present disregarded, there are immense possibilities. For information respecting its mineral resources the Province is at present dependent entirely on the reports of the Dominion Department of Mines. Such information is naturally limited. A Provincial Bureau could render a far more efficient service in this respect; and could, and undoubtedly would, do much to stimulate industry in new directions by indicating opportunities of which advantage has not yet been taken. It is meanwhile certain that the Western Provinces of Alberta and Saskatchewan will be ceded the control of their natural resources in the near future. The immediate establishment of an Albertan Bureau of Mines would merely anticipate, therefore, a need that sooner or later will have to be provided; but by organizing a department now it would be in a better position to meet the calls on it that changed conditions would create.

## THE LABOUR QUESTION IN PORCUPINE

The somewhat complicated circumstances surrounding the labour situation in Porcupine call for a few words of explanation.

Some time ago a Mine Managers' Association was formed in the Pearl Lake section of Porcupine. To this Association the Hollinger Gold Mines, Limited, did not belong. Among the first steps taken by the Association was the reduction of the wages of workmen. A Board of Conciliation was asked for and obtained. The Board was convened. The result of its deliberations was substantially to uphold the rates set by the managers. This decision was rejected by the men.

The Hollinger management, which was not in any way represented in the Association, and which, consequently, had no voice on the matter, quite unexpectedly became the storm centre. On November 15th, 1912, a number of men, not employees of the Hollinger, came on the property at change of shift with the object of forcing the Hollinger miners to strike. In this they were successful. In one day the working force of the mine was reduced from 478 to 118. The point to be remembered here is that the Hollinger management had absolutely no warning.

It had been maintained by the management that the men would be willing to continue work at current wages were adequate police protection provided. This, after the opening of the strike, proved to be the case. Under a guard supplied by the Provincial Police, work was rapidly resumed at the mine and little difficulty was experienced in obtaining men. Meanwhile, informations were laid against several of the agitators. Three cases were brought to trial. Two agitators, Cleary and Holowoskawe, were fined $500 each with the option of 90-day imprisonment, and a striker named Croft was fined $50 with an option of 60 days in jail. All three elected to go to prison. This occurred in January, 1913.

Notice of appeal was served by the defendants. which appeals will have been dealt with on March 26th. Meanwhile, however, the Dominion Department of Justice was petitioned by the miners to release the convicted men. Strange to relate, this request was promptly granted, and the men returned at once to Porcupine. We are credibly informed, further, that they immediately renewed the strike agitation.

Unless there be some occult reason for the action of the Department of Justice, we are convinced that nothing more derogatory to law and order could have been done. The offenders were given a fair trial. They were convicted. They deliberately chose imprisonment in lieu of paying their fines. It looks, therefore, very much as if the men had entire confidence in the leniency of the Department. Whether this be the case or not, it remains a fact that the whole machinery of justice in Porcupine has been made a laughing-stock.

If the so-called Lemieux Act, and it was under the provisions of this Act that proceedings were taken, is to be operative at all, it should be adhered to in letter and in spirit. If not, it should be wiped out.

Suppose, for example, that the managers were to hire "strong-arm" men to terrorize employees of companies that paid higher wages than did the Association. What would ensue can safely be left to the imagination. Yet the cases are quite parallel.

## THE HOLLINGER STATEMENT

Under date of February 25, 1913, the president and the general manager of Hollinger Gold Mines, Limited, respectively, have issued statements covering the periods July 1st, 1912, to December 31st, 1912, and December 3rd, 1912, to February 11th, 1913.

Three dividends, each amounting to $90,000, were paid during 1912. The complete plant cost $606,223.54, and the sum of $302,639.19, which includes fire loss of $111,811.96, is charged to development. After disbursing $270,000 in dividends, writing off $106,225.54 from plant account, and $122,639.19 from development account, or $228,862.73 in all, the balance carried forward is $101,801.69. The net operating profits for the six months were $600,664.42. Two dividends have been declared since the end of the year. Taking into consideration the labour disturbances that hampered the management during November and December, this showing exceeds expectations.

Mr. P. A. Robbins' statement for the first six weeks of this year shows that 9,562 tons of ore yielded $240,-300, the average return per ton being $25.13. As the cost per ton is about $6 to $7, and as the capacity of the mill is now greater by 15 per cent., it will be seen that the present rate of production is ample for the continuation of monthly dividends.

## EDITORIAL NOTES

On page 95 of our issue of February 1st, the bald announcement was made that four Nissen stamps were discarded by the Northern Customs Concentrator Company of Cobalt. This, as it happens, was quite unjust to the manufacturers of the Nissen stamp. The fact is that the four Nissen stamps have seen much duty and were worn badly. It was ,therefore, more expedient to replace them with the ordinary stamps of which the company had a supply on hand. In no sense was the incident a reflection upon the Nissen stamp.

According to recently published returns by the London Mining Journal, the average yield of ore milled last year on the Rand was 28s. 6d., or slightly under $7 a ton. This is rather below the estimate of 29s. 5d. made by Mr. Hugh F. Marriott in a communication to the Engineer and Mining Journal in January last. But in any event it is agreed that the yield per ton in 1912 was nearly a shilling greater than during the preceding year. This was largely discounted, however, by an increase in costs of eight pence per ton, costs in 1911 having been eighteen shillings. The profit per ton represented nine shillings and eight pence, or a penny more than was realized in 1911.

Tragic as is the position of Julian Hawthorne and his two associates, it is inconceivable to think that they could have persevered in their promotions for so long without knowing exactly what they were doing. Warning after warning must have reached them before they were brought to trial. While the Canadian Mining Journal was probably the first publication to draw attention to the character of their flotation, it was by no means the only one. It is a sad commentary on the ethics of Canadian newspapers that not a few of our leading dailies assisted the promoters editorially.

One of the most interesting and instructive papers presented at the recent annual meeting of the Canadian Mining Institute in Ottawa, was that by Mr. H. W. Dubois, of Philadelphia, descriptive of recent developments in connection with hydraulic mining in the Cariboo district in British Columbia. Rather over a year ago Mr. Dubois, who is engineer for the Quesnelle Hydraulic Gold Mining Co., installed, despite the opposition of his board of directors, high carbon steel rolled plates as a lining for the sluiceways. These plates were half an inch thick and 58 inches square, the carbon content being from 0.80 to 1.20 per cent. Previous to the use of the steel plates the sluiceways had been lined with diorite blocks or boulders, which actually wore as much as eight inches in three weeks. After a whole season's operation the steel plates showed practically no wear. At first glance this difference would appear almost incredible, but the expalnation is found in the fact that the steel rapidly assumes an ice-like surface over which the material passes with a minimum of friction. The important effect of the installation was the reducton of operating costs to 2 cents per cubic yard of the material handled, or about one-half of the previous season's costs.

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The advisability of increasing the field staff of the British Columbia Bureau of Mines was strongly urged in these columns some months ago. It is gratifying to uearn, therefore, that action in this direction has been taken, provsion having been made for placing two parties in the field this year in charge of competent assistants to the Provincial Mineralogist.

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The discussion of the revision of the Banking Act promises to be more than a farce. The House of Commons Committee has called upon Mr. H. C. McLeod, former manager of the Bank of Nova Scotia, to give evidence. As Mr. McLeod has been the only outspoken advocate of the external audit, and as it is common knowledge that he dared to think for himself and to set at nought the Bankers Association, his evidence will mean something. The country is sick of the complacent platitudes of such admirable watch-dogs of the "interests" as Sir Edmund Walker. We make bold to suggest that representatives of the industries, particularly of the mining industry, be called as witnesses. Much light could be thrown upon the relation of banks and bankers to promotions, organizations and operation.

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In the matter of profit distributions the mines of British Columbia made a better showing last year than for some time past; and there is now every promise that this record will be well maintained in the future. One of the several mines in this Province that paid handsome dividends to shareholders in 1912, was the Nickel Plate, at Hedley, in the Similkameen district, owned by the Hedley Gold Mining Company. According to the recently issued report of this company the ore treated last year averaged about $10.8, and yielded a net profit on the tonnage treated (70,455) of $385,880, of which $360,000, representing 30 per cent. on the capital, was distributed in dividends. With the showing now being made, there is every reason to expect a considerable revival of interest on the part of the investing public in British Columbia mining in the near future. At present the industry is on a sounder basis than at any previous time in its history.

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### GEORGE MATTHEY, F.R.S.

The death is announced, at eighty-eight years of age, of Mr. George Matthey, F.R.S., on February 14th. Mr. Matthey was throughout a long commercial life, keenly interested in the advancement of scientific technology. The industrial separation, purification and general manipulation of platinum and its associated metals formed the field of Mr. Matthey's labours.

The international metric commission which met in 1870 in Paris had for its object the construction and verification of a new series of standards formed of platinum with 10 per cent. of iridium. After considerable work and expense in purifying the metals the alloy was produced; but on further examination by chemical analysis, it was found to be impure and, consequently, useless for the purpose for which it was required. Mr. Matthey was then invited by the French Minister of War to attack the problem. He quickly commenced the work of producing large quantities of platinum and iridium of extreme purity, and later cast the ingots of the alloy in Paris. These ingots were submitted to most critical tests and careful analysis, and found to be precisely of the nature and composition required.

Mr. Matthey was then persuaded to devote his skill to the construction of the bars having the special type of cross-section which had been decided upon. To this end he purchased a second-hand lathe and set one of his skilled workmen to fashion the bars of the required cross-section. The bars produced were fully satisfactory. Copies of them were supplied to all the larger countries of the world, and they now form the standards upon which the metric system rests. Mr. Matthey was appointed a member of the Legion of Honour. He took great interest in the manufacture of the salts of platinum used in the production of platinum photographic papers.—A. G. B.

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## PERSONAL AND GENERAL

At the regular March meeting of the Council of the Canadian Mining Institute, held on March 4th. the following candidates for admission to membership were duly elected: Members—G. J. A. Buisson, Rossland, B.C.; Howard W. DuBois, Philadelphia, Pa.; Cadwallader Evans, Stellarton, N.S.; Thos. J. Flynn, Cobalt, Ont.; H. L. Forbes, Ottawa, Ont.; Gwynn G. Gibbins, Vancouver, B.C.; Chas. Spearman, Haileybury, Ont.; Bush Winning, Ottawa, Ont.; and Associates—Geo. C. Riley, Montreal, Que.

We congratulate Mr. C. V. Brennan, chief engineer of the Utah Con. Mining Company, of Bingham, Utah, on his recent marriage. Since his graduation from McGill four years ago, Mr. Brennan's career has been a brilliant one.

Mr. John McLellan, who is operating a small gold mine on one of the Queen Charlotte Islands, has returned from a visit to England.

Mr. Charles Fergie, of Montreal, left last week to inspect the collieries in Alberta for which he is consulting engineer. He will remain in the West for some weeks.

# CORRESPONDENCE

## "PERSONALS."

Home Life Building, Toronto, Ont.,
March 19th, 1913.

Editor, Canadian Mining Journal,
Toronto, Ontario.

Sir,—One cannot help but notice in reading the "Personals" in the various mining periodicals, the constant repetition in the names of engineers mentioned. This is undoubtedly a double hardship. It is unfair that a few engineers should bear the burden of sustaining this column by the constant and unwelcome use of their names, and it must be annoying to the editor to be compelled to repeat so often, and to lack in the supply of new matter for his readers. It occurs to me that if the busy or the modest engineer were furnished with adequate facilities for supplying this interesting information regarding himself and his whereabouts, it might largely act as a relief from this onerous burden.

With this in mind, I have drawn up an outline for a plan to furnish blanks to the various engineers,† which can be easily filled and posted to the journals. If these were properly elaborated they would reduce the labor of furnishing this information to a minimum, and would be a constant inducement to supply the various journals with this most important information.

I have simply attempted a meagre outline of a few of the paragraphs which should be included in this form. I leave it to your ingenuity and literary skill to enlarge, knowing that you are more capable of judging the necessities of the profession in this regard than I am. I suggest that if the subject were properly elaborated and copyrighted, it might be a permanent and large source of revenue.

Yours respectfully,
F. L. CURTIS.

**Form "A"**

..............................has (returned from)
*(Name of Engineer) (gone to)
.................... where he* ..................
*(Name of place)
..............................................

**Form "B"**

..............................has (resigned his)
*(Name of Engineer) (accepted a)
position with* ....................................
His many friends note with (pleasure) that*.........
(regret)
..............................................

**Form "C"**

(has gone to)
............................(has returned from)
*(Name) (is at)
.......................... *(He, or they if plural)
*(Name of place)
(is (or are) to make)
(is (or are) making) examination of................
(has (or have) made)
..............*He says (or they say)*.............
..............................................

**Form "D"**

We are (pleased) to note that*...................
(sorry)
..............................................

*Note.—Please insert at place marked with an * and draw line through those words not necessary to convey meaning intended.
†The writer wishes to disclaim any intention of despatching engineers by parcel post.

## THE NEW MINISTER OF MINES.

Louis Coderre was born at St. Ours, Quebec, on the 1st of November, 1865. His parents, Alfred Coderre and Emma Fontaine, were both French-Canadians. The former was superintendent of the locks at St. Ours from 1888 to 1898.

Mr. Coderre was educated at the Primary School, St. Ours, St. Hyacinthe, and Montreal Colleges, and Laval University, Montreal. On the 1st of July, 1895, he was married to Marie Anne Sophie, daughter of Edouard Ste. Marie, of St. Henri, Montreal. He has two sons and two daughters.

Serving as a law clerk with Mr. Pagnuelo—who is now a justice in Montreal, and graduating in 1912, he became a partner in the firm of Primeau and Coderre. At the present time he is one of the firm of Coderre, Fortin and Coderre. In 1885, he was appointed City Solicitor for St. Henri, retaining the position until St. Henri was merged in Montreal.

Mr. Coderre was also legal adviser to Ville Emard from 1906 until it was annexed to Montreal. For five of the Montreal Bar, which is an elective office.

Although Mr. Coderre has always taken an active interest in political life, both legal and national, he did not seek any public office until June, 1908, when he ran against Mr. Decarie, in Hochelaga, for a seat in the Quebec House. He was defeated. Again in October of the same year he was candidate against Mr. Rivet, the Liberal candidate for the Dominion Parliament, but was defeated by a majority of only 185. In 1909, he sought office as a Controller of Montreal as an independent candidate, and was fifth in line for position, but as only four Controllers were to take seats he was again left on the outer circle of success. At the general election, September 21st, 1911, Mr. Coderre ran as the Conservative candidate against his old opponent, Mr. Rivet, and polled a majority of 1,373.

He is a Conservative in politics, a Roman Catholic in religion, and resided in Montreal.

# CANADIAN MINING INSTITUTE ANNUAL MEETING 1913.

## DR. A. E. BARLOW'S PRESIDENTIAL ADDRESS

(Continued from last issue.)

In 1846, owing to activity in prospecting and locating mineral lands on the southern shore of Lake Superior, and a favourable report by Mr. W. E. Logan, then (1842) newly appointed Provincial Geologist, some enterprising Canadians banded themselves together into two associations called "The Montreal Mining Company" and the "Upper Canada Mining Company." The former company having purchased, amongst others, what was then known as "The Bruce Mines Location," while the Upper Canada Company proceeded to develop the Wallace mine, the first place in Canada in which nickel had been discovered. The Montreal Mining Company continued operations from 1846 to 1865, when, from a variety of causes, the work proved unremunerative.

These early references to attempts to carry on mining operations, while instructive and interesting, have only an indirect bearing on the present status of the industry. The real inception of mining may be said to date from the completion of the constructon of the Canadian Pacific Railway in 1885. This rendered accessible a vast territory, much of which was underlaid by mineral bearing formations. Since then progress has been rapid and well sustained. It is thus interesting to note that in 1886, the first year for which complete statistics of the mineral production for the whole of Canada were collected, the value was reported as $10,-221,255, or about $2.23 per capita. In the succeeding ten years the value of the mineral production had increased over 100 per cent. representing the sum of $22,474,256, or $4.38 per capita in 1896. Chiefly as a result of gold mining activity in the Yukon, the increase in the next five years was nearly 200 per cent., the total value of mineral production in 1901 being $65,797,911, or $12.16 per capita. For the three years following there was a slight decrease from this amount, but in 1905 a very substantial increase was made the total value of the mineral production in this year being $69,525,170. From this year, the increase was steady and rapid until 1910, when the grand total registered was $106,823,623, averaging $14.93 per capita of population. In 1911 the mineral production showed a decrease of a little over 3 per cent. as compared with that of 1910, the total amount being valued at $103,220,994, or an average output per capita of $14.42. In 1912 there was again a very large increase, the total value amounting to about $133,127,489, or over $18 per capita.

Ontario has now taken her place as the premier province in mining of the Dominion, having passed British Columbia in 1909. The relative importance of the provinces as mineral producers for 1912 are as follows: Ontario contributed 38.33 per cent.; British Columbia, 22.20; Nova Scotia, 14.15; Quebec, 8.77; Alberta, 9.10; Northwest Territories, 4.42; while Manitoba, New Brunswick and Saskatchewan together only accounted for 3.03 per cent. of the total mineral output. As is probably well known to all of you present, Ontario is famous for its production of silver, nickel, copper, natural gas, cement and clay products; British Columbia for coal, gold, copper, silver and lead; Nova Scotia is chiefly noted for its coal and gypsum, and also in a minor degree, gold, stone and clay products. Asbestos accounts very largely for the Quebec mineral products, although graphite, cement, stone, copper and pyrites figure rather prominently, especially the three first mentioned products. Alberta's production is largely made up of values obtained from its coal, cement and clay products.

The mineral products of the Yukon are gold and coal, with some silver and copper. Manitoba produces gypsum, clay and stone products; Saskatchewan, coal and clays, while New Brunswick, which is the last on the list of provinces as a mineral producer, has chiefly gypsum, coal, iron and stone products.

The construction of the Canadian Pacific Railway was directly responsible for the discovery of the Sudbury nickel copper deposits, a mineral field which has, up to the present time, produced a total value of about 80 millions of dollars.

In 1877 asbestos was discovered in the serpentine hills of Thethford and Coleraine in Quebec, but it was not until 1884 that mining had made such progress that 1,141 tons were quarried, valued at $75,097. In 1912, the total production of asbestos was 111,175 tons, valued at $3,059,084, while the aggregate production to the end of the year had reached a value of nearly $35,-000,000. Quebec now contributes more than 75 per cent. of the world's total production of asbestos.

It was not until 1890 that claims were located on the gold-copper lodes which have made Rossland famous as a mining camp, and attracted attention to the whole interior of southern British Columbia. Since that time the production from this district alone has been more than $55,000,000.

The discoveries at Rossland stimulated prospecting over extensive areas in southern British Columbia, and in 1891 the ore bodies in the vicinity of Greenwood and Phoenix in the Boundary district were located. About the same time coal mining was becoming quite extensive in Alberta; while although the Klondike District of the Yukon was discovered in 1894, it did not become prominent until 1896. All of these discoveries and consequent active mining development work greatly stimulated interest in the mineral and the other natural resources of the country.

This period marked the real beginning of that considerable expansion which has since been so extraordinary. Cobalt was discovered in 1903, by the building of the Temiskaming and Northern Ontario Railway, and to the end of 1912 has produced nearly 32 million dollars worth of silver.

More interesting, however, than this brief narration of the marvellously rapid development of the mineral industry of Canada, are its future possibilities. None of us can realize the truly magnificent future of this vast Dominion, with an area greater than that of the United States, and almost equal to that of the whole of Europe. Two-thirds of this total area of Canada (3,729,665 square miles) is underlain by rock formations which, where adequately examined and prospected, have been found to contain exceedingly valuable, and in many cases, unique mineral deposits. In attempting to predict the future of the mineral industry of Canada, we have a few outstanding facts that should be of great assistance in this connection.

The Great Canadian Shield, or Protaxis, of North America, is a term in general use to designate the great V-shaped area of Pre-Cambrian rock which surrounds Hudson's Bay, extending from Labrador almost to the mouth of the Mackenzie River. The area of this great mass of very ancient crystalline rocks has been estimated at 2,000,000 square miles. Along the southern border it contains the nickel deposits of Sudbury, which contributes more than 70 per cent. of the world's supply of nickel, and which, in the near future owing to alterations and extensions undertaken, is likely to be more than doubled. At Cobalt are the world-famous silver deposits, whose development has given Canada third place in the world's silver producing countries. In the extension of these pre-Cambrian rocks into the United States, southwest of Lake Superior, are found the greatest iron mines in the world, with an estimated available ore of 1,950,000 tons, to which must be added 20.5% which had been consumed up to the close of 1910. In this area is situated also a copper camp which in the total of its production is the greatest in the United States. It is believed that similar copper bearing rocks, occupying a still greater area, and likely to be at least as richly productive, occur in the vicnty of Coronaton Gulf and Bathurst Inlet in the Arctic Ocean. A description of this mineral bearing area, from information then available, was given last year by one of our members, Mr. J. B. Tyrrell (Trans. Can. Min. Inst. Vol. xv., pp. 508-534. At this meeting Dr. James Douglas will give a detailed statement of the results of an exploration which has recently been conducted under his auspices. In these circumstances, therefore, it seems entirely reasonable to assume that these great northern areas contain vast deposits which will become available with the opening up of the country, and consequent furnishing of transportation facilities.

The immense possibilities of Canada from an agricultural standpoint are now a matter of general agreement, but the potentialities of mining in Canada are not so commonly known. It is the speaker's firm conviction that Canada's future greatness will depend more upon her mineral production than upon any other of her natural resources. Many of us have an abiding faith in the great lone northland, with its apparently barren and waste sketches of rock and water. The call for its successful development is as compelling as the missionaries' cry which came over from Macedonia. National greatness can only be achieved by obeying this mandate. An empire, half a continent, awaits the march of civilization. We may not falter or hold back.

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# INTERNATIONAL GEOLOGICAL CONGRESS

**Meeting of Organization Committee, Ottawa, Tuesday, March 4th, 1913.**

The Organization Committee of the Twelfth International Geological Congress met at the Chateau Laurier, Ottawa, at 10.00 a.m., on Tuesday, March 4th, 1913.

Present—Dr. Adams, President, in the chair; R. W. Brock, General Secretary; W. S. Lecky, Secretary; and Messrs. M. B. Baker, A. E. Barlow, D. D. Cairnes, C. Camsell, A. A. Cole, A. P. Coleman, T. C. Denis, D. B. Dowling, J. A. Dresser, E. Dulieux, E. R. Faribault, W. F. Ferrier, W. L. Goodwin, Abbe R. C. Guimont, Eugene Haanel, E. Haycock, E. D. Ingall, E. M. Kindle, C. W. Knight, Lawrence M. Lambe, W. W. Leach, O. E. LeRoy, G. G. S. Lindsey, R. G. McConnell, J. McEvoy, W. McInnes, J. McLeish, W. G. Miller, W. A. Parks, J. B. Porter, W. Fleet Robertson, F. H. Sexton, J. B. Tyrrell, T. L. Walker, James White, A. B. Willmott, G. A. Young.

There were also present by invitation the following gentlement who are leaders of excursions: Messrs. J. W. Goldthwait, W. A. Johnston, Percy E. Raymond, John Stansfield.

Absent—Messrs. J. A. Allan, H. M. Ami, J. A. Bancroft, A. G. Burrows, Eugene Coste, R. D. Falconer, R. P. D. Graham, R. R. Hedley, R. A. A. Johnston, Joseph Keele, H. Mortimer-Lamb, G. F. Matthew, W. Nicol, J. T. Stirling, R. C. Wallace.

Mr. Frank B. Taylor, leader of one of the excursions had also been invited to attend, but was unable to do so owing to serious illness in his family. Dr. John M. Clarke, a leader, had also been invited but was unable to attend.

**Minutes of Meeting of December 2nd, 1910.**

The minutes of the inaugural meeting which took place on December 2nd, 1910 were read for the information of the Organization Committee:

Minutes of the preliminary general meeting held in Toronto on the second day of December, Nineteen Hundred and Ten to appoint the executive Committee of the Twelfth International Geological Congress, adopted as the minutes of the first executive meeting.

At the instance of the Director of the Geological Survey a meeting of Canadian geologists and Mining Engineers, was called for December 2nd, at 11 a.m., in Toronto to arrange for the Twelfth International Geological Congress, which is to be held in Canada.

There were present Dr. F. D. Adams, Mr. J. C. Murray, Mr. O. E. LeRoy, Mr. H. Mortimer-Lamb, Mr. J. A. Bancroft, Prof. E. Dulieux, Dr. T. L. Walker, Prof. M. B. Baker, Mr. J. B. Tyrrell, Mr. James McEvoy, Dr. W. G. Miller, Dr. W. A. Parks, Mr. J. McLeish, Dr. A. P. Coleman, Mr. R. G. McConnell, Mr. G. G. S. Lindsey, Mr. O. N. Scott, Mr. W. McNeill, Mr. W. S. Lecky, Mr. R. W. Brigstock, Mr. F. Loring, Mr. A. A. Cole, and Mr. R. W. Brock.

Dr Adam called the meeting to order and exand Mr. R. W. Brock, Secretary.

Dr. Adams caleld the meeting to order and explained the object. On motion of Dr. Miller, seconded by Dr. A. P. Coleman it was decided that the Congress should be held in Canada in 1913, this date being chosen on account of the British Association Meeting in Australia in 1914, and possibly the Winnipeg Exposition in Canada, also in 1914. The meeting then proceeded to elect officers for the Congress.

On motion of Dr. Miller, seconded by Dr. Coleman, Dr. Adams was elected President. Dr. Coleman moved and Mr. James McEvoy, seconded that Mr. R. W. Brock be elected Secretary, Dr. Miller and Mr. Tyrrell suggested that the offices of treasurer and secretary be combined. This was included in Dr. Coleman's motion and the motion thus amended was carried. On account of the great amount of work which would be necessary to make the meeting a success it was decided that a paid secretary or manager should be appointed to assist the secretary and Executive Committee.

The question of committees was then discussed, but it was decided that before these could be formed it would be necessary to decide upon the place of meeting.

Dr. Miller moved, seconded by Dr. Parks that the Congress be held in Toronto. This motion was carried.

In the discussion the point was brought out by Dr. Walker that local meetings might be held in the east and west as well as the main meeting at Toronto. This suggestion met with the approval of the meeting.

The discussion regarding committees was then resumed. In the course of the discussion it was was brought out that a large honorary committee, a large general committee, local committees, and an executive committee would be necessary. As a great deal would depend upon the careful selection of these committees it was decided to appoint a small executive committee who could spend some time and thought on the selection of the other committees. It was moved by Dr. Miller and seconded by Mr. LeRoy and carried, that the President, Secretary, Dr. Coleman and Mr. Tyrrell should be apointed a committee to recommend to this meeting names for an executive committee. It was moved by Dr. Miller, seconded by Mr. McEvoy that Dr. Coleman and Mr. Tyrrell be members of the executive committee. The committee nominated then retired and after fifteen minutes consultation recommended the following names as an executive committee: F. D. Adams, R. W. Brock, A. P. Coleman, J. B. Tyrrell, W. G. Miller, O. E. LeRoy, W. McInnes, T. Denis, W. A. Parks, G. G. S. Lindsey. The convener pointed out that the names were confined to persons living in the central part of the country on account of the necessity of the committee meeting at frequent intervals.


It was moved by Mr. Cole, seconded by Mr. McEvoy that the gentlemen recommended be appointed an executive committee of the Geological Congress with power to add to its members.—Carried.

Dr. Walker moved that the general committee, honorary committee and any other committees that might be found necessary be appointed by the Executive Committeee. This was seconded by Mr. M. B. Baker, and carried.

Dr. Walker moved, seconded by Dr. Miller that the Executive Committee be authorized to appoint vice-chairmen of committees who could act in case of the absence of the chairman.

An informal discussion then took place regarding the excursions which it was felt should be the main feature of the Congress in Canada. Various suggestions were made and it was decided to have the members consider this question carefully and send their suggestions to the Executive Committee who would go thoroughly into the matter.

On the question of major subjects for the Congress, it was felt that it might be advisable to get up a special memoir on coal similar to the one on the Iron Ores of the World prepared for the past Congress, as this subject would be supplementing the Iron Memoir.

The secretary stated that Dr. J. G. Anderson, secretary of the Eleventh Congress, had called attention to the fact that the Congress had accepted the proposal of Dr. Hobbs that an international inquiry on the subject "The Fracture System of the Earth's Crust" should be undertaken; that Congress in accepting this proposal expressed its opinion that the manner employed by the Swedish executive committee when undertaking inquiries on the iron resources and the post-glacial climate could serve as a model to the coming executive committee of Canada when organizing the proposed enterprise, and charged the named committee to arrange the matter with Dr. Hobbs.

The subjects for the Congress were left to the executive committee.

The meeting then adjourned to attend a lunch given by the Toronto Branch of the Canadian Mining Institute.

### Communications From Absentees.

The President read letters of regret from absentees.

### The General Objects and Work of the International Geological Congress.

The President briefly outlined the general objects and work of the International Geological Congress. As information on these subjects is contained in the Canadian Edition of the Second Circular which will be in the hands of members in a few days time, it is not repeated in these minutes. The President mentioned the splendid work which had been accomplished in the course of the different sessions, both in pure and applied geological science and which had resulted in such important publications as the Geological Map of Europe and the Monograph on the Iron Ore Resources of the World, the latter of which had been instrumental in starting new industries in various countries. In his closing words the President pointed out that the Twelfth or Canadian Session would accomplish its mission if it were successful in giving to the world in easily accessible form the results of geological research since the time of its last session and in particular he mentioned the publication which had been in preparation now for more than two years of the Coal Resources of the World. He hoped that the Canadian Geologists and particularly the younger members of the profession would gather great help and inspiration from meeting so many celebrated men from various countries.

### Arrangements for the Twelfth Session.

The General Secretary, Mr. R. W. Brock, outlined briefly the manner in which the Congress had been asked to hold its Twelfth Session in Canada and the general arrangements made up to the present time. The Congress had been invited by the Government of Canada, the invitation being officially transmitted through the foreign office and through the British Ambassador in Sweden. The Government invitation had been supported by the Province of Ontario conveyed personally at the Eleventh Session in Stocholm by Dr. Miller, the Provincial Geologist of Ontario and by the Canadian Mining Institute by the then President, Dr. Adams, who also on this occasion represented the Government of Canada and by the Royal Society of Canada.

The Government of Belgium had invited the Congress to hold its Twelfth Session in that country but the Canadian invitation, which was made for the second time, having previously been made in 1907 was accepted.

On December 2nd, 1910 an inaugural meeting was held in Toronto, the minutes of which were read today. It was called at the instance of the speaker acting for the Government as the Director of the Geological Survey. At it were present representatives of the Institutions who had invited the Congress to be present in Canada and as shown from the minutes of the meeting a small executive committee was appointed with instructions to appoint such other committees as might be required as and when they were required.

Committees dealing with the following subjects have been appointed: Coal Resources, Editorials, Excursions, Finance, Leaders of Discussions, Official Invitations, Patronage, Publications, Qualifications for Membership, Toronto Local, Transportation, and a committee to appoint an Assistant Secretary. Some of these committees have completed their work and have been dissolved but most of these are still active and consist of one or two members of the Executive Committee with in some cases other gentlemen but in each case they report direct to the Executive Committee which makes itself responsible for the financial arrangements. The Organization Committee had also been appointed and was meeting to-day for the first time.

With regard to the Monograph on the Coal Resources this will consist of 1,200 pages published in three volumes accompanied by an atlas of 70 maps. The work was well under way under the editorship of Messrs. William McInnes and D. B. Dowling and there was every reason to believe that it would be published in time and be a credit to the country.

The excursions would, no doubt, be the leading feature of the Congress and every effort is being made to make them attractive both to geologists and mining engineers. The itineraries of the excursions were contained in the second circular which was in the hands of the committee and it was therefore unnecessary to detail them. The guide books would consist of fifteen volumes comprising a total of more than 1,600 pages and a large number of maps. The manuscripts for the guide books were all completed with one exception and most of the material is in the hands of the printer and has reached the stage of galley proofs.

### Co-operation of the Mines Branch.

Dr. Eugene Haanel stated that as the excursions had already been planned and the routes made up he was a little at a loss to know in what way he could assist but he pointed out that there were on his staff men than whom there were none better qualified to serve as guides on the excursions, for example, there were on his staff one mining engineer who had made a study for the last three years of the copper resources of the Dominion and another who had made a specialty of mica and another who had made a study of iron ore deposits. Dr. Haanel assured the committee that he would give the Congress his hearty support and active assistance and would be glad for members of his staff to act as guides and to assist in the excursions. Dr. Haanel added that he thought that some of the monographs or summaries of the monographs published by the Mines Branch would be useful for distribution at the meeting and he stated that he had, in anticipation of the meeting, ordered a large number of Dr. Coleman's map of the nickel-copper deposits of the Sudbury district.

The President thanked Dr. Haanel very heartily for his promised assistance and pointed out that as this was a Geographical Congress we had not been able to make mining the principal object of any excursion but that in most of the excursions it was a very important incidental object and that as many visits to the mines and mineral deposits as possible would be made and that in connection with these the committee would take advantage of Dr. Haanel's kind offer and secure assistance from the members of his staff. Dr. Adams also pointed out that while the general routes and the leader of each excursion had been settled the list of guides had not been settled and also the routes and points to be visited were open to alterations. The Executive Committee would be glad to receive suggestions. Dr. Adams expressed a hope that the International Mining Congress which held its next meeting in 1915 in England could be induced to meet in Canada in 1920 when mining would be the principal object of the excursions.

### The Tenth Session in Mexico in 1906.

Dr. W. G. Miller gave a short address on the Tenth Session which was held in Mexico in 1906. He dwelt upon the generous support given by the Mexican Government in the way of money grants, free transportation on railways, great reduction in fares on steamers, etc. He was of the opinion that we could not hope to equal the brilliant social side of the Tenth Session and spoke feelingly of the hospitality of the Mexican people. The outstanding achievements had been:

(1). The guide books which had been pubilshed, giving exhaustive information on mining areas in Mexico.

(2). The Geological map of North America which had been so favourably commented upon by the technical papers.

### The Eleventh Session in Sweden in 1910.

Dr. A. P. Coleman gave an account of the Eleventh Session held at Stockholm, Sweden, in 1910. Dr. Coleman mentioned that while French was the official language of the Congress, English and German seemed to be predominant. The Swedes had made their preparations a long time ahead and their arrangements were carried out as planned and they had shown wonderful organizing ability which it would be hard to equal in Canada. The only criticism he had to make was on the belated publication of the "Compte-Rendu" which appeared more than two years after the Session. He thought that Canada ought to do better in this respect.

### Financial Requirements of the Twelfth Session.

Mr. G. G. S. Lindsey, chairman of the Finance Committee mentioned that the Executive Committee had been promised about fifty thousand dollars and that they expected to require about seventy-five thousand, all of which was needed for the general purposes of the Congress. Money necessary for local entertainments must, in his opinion, be raised locally.

The list of Honorary Councillors would be printed in the Canadian Edition of the Second Circular which had recently been destroyed by fire and he thought that the Honorary Councillors could be approached for financial support in the matter of local entertainments and local expenses.

Mr. Lindsey mentioned that the central part of the Twelfth Session would, in his opinion, be the excursions and he considered it to be the duty of the leaders to see that the social side of the excursions be properly conducted and that on a high standard.

### Duties of the Organization Committee.

The General Secretary read the following report enumerating the duties of the Organization Committee and this report was adopted without discussion.

"It has been the custom of previous geological congresses to have a general Organization Committee consisting of from thirty to sixty members who were, as a rule, well known geologists or mining engineers of the country in which the Congress was being held.

"In the case of the Twelfth Session a general meeting was called on December 2nd, 1910, and it was there decided that owing to the long distances in Canada it was best to elect a small central committee that would act as an Executive Committee and to give this Executive Committee authority to appoint any other committees that might be necessary.

"The Executive Committee, towards the end of last year, felt that it was time to have a more general committee and therefore asked various gentlemen throughout Canada to become members of the Organization Committee with the results of which you are aware.

"The chief duties which the Executive Committee had in mind for the Organization Committee were:

1st. The formation of local committees at various points which excursions of the Congress will visit.

2nd. General assistance in making arrangements for the Congress and in carrying out these arrangements.

3rd. Assistance, if necessary, in raising funds to assist in financing."

### Duties of Local Committees.

The General Secretary read the following report which was adopted without discussion.

"Local committees will be formed at the instance of members of the Organization Committee or in places where there are no members of the Organization Committee then by arrangement with the Executive.

"The duties of the local committees are to make all necessary local arrangements acting in co-operation with the Executive Committee and with the leaders of excursions. Before any arrangement is actually complete it should be communicated to the Executive Committee through the secretary in order that there shall be no confliction of plans.

"With regard to funds any entertainments or arrangements which are of a purely local character and which would not be undertaken by the Congress as a whole in the ordinary course of events must be financed locally but other liabilities, provided they have been previously approved by the Executive, will be assumed by the Executive. For example, the hire of carriages between the station and the point of interest which is planned in the excursion would, if necessary, be paid by the Executive Committee as the expenses would be considered part of the excursions. All local entertainments such as Indian plays which are of purely local interest and supposed to be offered by the people of the place would have to be financed locally.

"At the time of the excursions it is expected that the Executive will be represented on each excursion by a secretary and if this plan is carried out the local committee will deal direct with the secretary of the excursion in each case.

"In the formation of local committees it is requested that local branches of the Canadian Mining Institute as well as various scientific societies as far as possible, be represented. Local committees should not be too large or if it is found advisable to have large committees then an executive should be chosen to carry on the work."

**Places at Which Local Committees are Necessary.**

The General Secretary read a list of places at which local committees were necessary. This list was added to by various members of the committee present and the following list was adopted it being understood that local committees can be formed at any other places as and when required.

Nova Scotia—Sydney, Halifax.

New Brunswick—St. John, Moncton.

Quebec—Quebec, Sherbrooke (for the Eastern Townships), Montreal.

Ontario—Ottawa, Toronto, Kingston, Sudbury, Niagara Falls, Hamilton, Collingwood, Cobalt, Porcupine, Kenora.

Manitoba—Winnipeg.

Alberta—Medicine Hat, Calgary, Edmonton.

British Columbia.—Nelson, Kamloops, Vancouver, Victoria.

Yukon Territory—Dawson City.

Dr. Goodwin thought it advisable to add Michipicoten to the list and that a visit should be paid to this district. Dr. Goodwin thought that the Lake Superior Corporation would be very glad to assist and that we could visit Sault Ste. Marie and that we could travel by the Algoma Central Railway to Michipicoten and then reach the main line of the Canadian Pacific Railway at Hobon.

Mr. J. A. Dresser stated that he was quite sure that the Lake Superior Corporation would be glad to do anything in their power and the Algoma Central Railway had already promised transportation facilities should we require them. It was finally decided to leave the question of an excursion to Sault Ste. Marie and Michipicoten to the Executive Committee.

**Special Names to be Placed on Local Committees.**

The General Secretary read a geographical list of members of the Organization Committee, Honorary Councillors, and Leaders of Excursions. It was thought that local committees could be formed from this list with such other persons as it may be considered advisable to ask.

Mr. James White stated that in each place where there is a branch of the Canadian Mining Institute the chairman of such branch should be added to the committee. Various other names were suggested including Sherbrooke: Mr. George R. Smith of Bell Asbestos Mines and Col. J. J. Penhale. Victoria: Mr. W. J. Sutton, chairman and E. Jacobs, secretary, Western Branch of the Canadian Mining Institute. Winnipeg: A. J. Merrill, member of the Canadian Institute and T. R. Deacon, Mayor of Winnipeg, member of the Canadian Society of Civil Engineers and at one time considerably interested in mining.

Regarding the formation of local committees, an animated general discussion took place in which most of the members present took part. It was finally decided on the suggestion of Mr. Lindsey that the members of the Organization Committee and Leaders of Excursions present should meet after lunch and arrange for the local committees by forming themselves into groups according to Provinces.

**Extraordinary Duties of Any Particular Local Committee.**

Various local committees will have special duties peculiar to themselves and not provided for in the general duties. As examples of this the General Secretary read the following notes:

The Toronto Local Committee will have a great many extra duties incidental to the fact that the Congress is meeting in Toronto.

A day is spent at Ottawa, and the Ottawa Local Committee will be expected to assist in securing suitable hotel accommodation.

A day will be spent in Montreal, and the Montreal Local Committee will be expected to assist in securing suitable hotel accommodation.

It is possible that the train for excursion C. 2 will have to be shortened at Kootenay Landing, and if this is the case the Nelson Local Committee will be expected to find accommodation for the members who are deprived of their sleeping cars.

**Financial Requirements.**

This matter had already been dealt with in Mr. Lindsey's address earlier in the morning and Mr. Lindsey stated that he had nothing further to add to his remarks.

**Programme of the Twelfth Session.**

The programme of the Twelfth Session as printed and distributed on February 7th, was read and adopted, subjects to such revision as may, from time to time, be necessary.

**Local Memorial.**

In the temporary absence of Dr. Barlow, who had an appointment in connection with the Canadian Mining Institute meetings, Mr. Brock read the following memorandum from the Minutes of the Thirteenth Meeting of the Executive Committee, held in Ottawa on February 1st.

"Dr. Barlow reported that this Committee recommend that a memorial plate be erected in Perce on the occasion of the visit of the Congress and that a tablet be placed in the Victoria Memorial Museum on August 1st on the occasion of the visit of the Congress and that the expenses be defrayed by subscriptions from members of the Organization Committee. It was left to the Logan Memorial Committee to continue their work regarding the memorial, including the subscriptions to be secured."

He estimated that the cost of the two tablets would amount to a total of about three hundred dollars, which amount should be collected by the Organization Committee.

Mr. Ferrier thought that this amount could easily be secured from the members and ex-members of the Geological Survey. Mr. Brock replied that in his opinion the memorial to the late Sir William Logan would be more honoured if the subscriptions were collected from a wider circle.

The President spoke in the same strain pointing out that it was originally the suggestion of Dr. John M. Clarke, a former member of the Geological Survey of Canada. Dr. Clarke's suggestion being that in the course of excursion A.1. a tablet should be erected at Perce where so much of Sir William Logan's work had been accomplished.

Dr. Barlow, who had now returned, made a few remarks eulogizing Sir William Logan as one of the greatest economic and scientific geologists. Dr. Barlow was of the opinion that the amount required should be raised by subscriptions from the Organization Committee.

Mr. Ferrier suggested the erection of a rough stone monument with a tablet in front of the Museum in Ottawa. After further discussion it was moved by Mr. W. Fleet Robertson, seconded by Mr. W. F. Ferrier and carried:

That the Logan Memorial Committee consisting of Messrs. Barlow, Brock, Coleman and Miller be instructed to proceed with the arrangements for the erection of suitable memorials to the late Sir William Logan, the locations and characters of the memorials to be left to the named committee and that the members of this Organization Committee guarantee the expenses up to the sum of five hundred dollars.

### Announcement of Afternoon Session.

The President announced that the Leaders of Excursions were to meet in the afternoon at 3 p.m., and that after this meeting there would be another meeting of the Organization Committee to consider the reports of the provincial sub-committees regarding the local committees which were to be made by the provincial sub-committee who were also to meet this afternoon acting on Mr. Lindsey's recent suggestion.

The meeting then adjourned.

### Luncheon.

Luncheon was served in a private dining room at the Chateau Laurier at 1.10 p.m. The Right Hon. R. L. Borden, and the Hon. Frank Cochrane, two of the Honorary Vice-Presidents were present and made brief addresses in which they assured the members of the committee both of their personal and official interest in the Congress. After the luncheon the Ministers made a point of meeting many of the members and discussing the Congress affairs with them.

### Afternoon Meeting—Local Committees.

As arranged before luncheon the members of the Organization Committee formed themselves into groups according to Provinces and discussed the matters of Local Committees and additional Guides to excursions.

The Organization Committee met again about 5 p.m., to consider these reports and various Local Committees were suggested and names added. As this matter has, necessarily, to be proceeded with further the list is not given in these minutes, but when further completed will be printed and distributed in the form of a separate leaflet.

### The President's Closing Remarks.

The President took occasion to state that the Executive Committee would be glad to receive special reports dealing with subjects of geological or mining interest for distribution at the time of the Congress. He mentioned that it would be a good policy for commercial companies connected with the mineral industry to have a number of descriptive pamphlets prepared for the use of members of the Congress. He also mentioned that at the Swedish Congress picture post cards had been printed and distributed which showed scenes of particular beauty or mineral or geological features of interest.

The meeting then adjourned.

R. W. BROCK, General Secretary.
W. S. LECKY, Secretary.

# THE "DE RE METALLICA" OF GEORGIUS AGRICOLA.*

## A REVIEW

In the pride of our modern achievements we are prone to look with pitying eye upon the seemingly meagre progress made by man in centuries past. It tittivates our self-esteem to believe that we are whole heavens above the generations that have gone. A wise Providence has ordained, however, that we should not be without salutary lessons in humility. And it is with much humility that the readers of **De Re Metallica** turns the last page of that remarkable book.

Three and one-half centuries, ago, Georgius Agricola, a native of Saxony, gave to the world the first edition of "De Re Metallica." To be exact, the work appeared in the year 1556. It was the fruit of twenty years' investigation, observation and practice, and it embodied the best current knowledge of mining and metallurgy. Nor was it superseded until more than two centuries had elapsed.

Strange to relate, this noble volume, which was written in Latin, was translated only into German and Italian. Dating not later than the latter part of the seventeenth century, all these translations were inaccurate and inadequate. Particularly was this the case with the first German translation.

Briefly, although in a general way, Agricola's *magnum opus* has been known to the scientific world for long, and although there are many Latin copies extant, yet until now no brave spirit has girded up his loins for the task of rendering it into any modern language. Thus there has remained almost unseen and unused one of the chiefest jewels of scientific literature.

It has remained for a mining engineer, well known to all readers of current technical books, assisted by his wife, to open for us the treasure-house of **De Re Metallica**. Mr. Herbert Clark Hoover, whose name is familiar to us as the author of "**Principles of Mining,**" and his wife, Lou Henry Hoover, are the two devoted transliteraters of Agricola. To them we owe the appearance, belated but all the more welcome for that, of the magnificent volume that has just been issued in London. Mr. Hoover is a particularly sane and thorough engineer and writer. Mrs. Hoover, by a most fortunate accident, is an accomplished Latinist, and, in addition, a person of much scientific knowledge. No combination could have been more fortunate. Five years of intermittent, though arduous, labour were devoted to the execution of the idea—an idea conceived and carried out entirely in the interests of scholarship.

"We do not present **De Re Metallica,**" say the authors in their preface, "as a work of 'practical' value. The methods and processes have long since been superseded; yet surely such a milestone on the road to development of one of the two most basic of human industrial activities is more worthy of preservation than the thousands of volumes devoted to records of human destruction. . . . . If the work serves to strengthen the traditions of one of the most important and least

*Georgius Agricola De Re Metallica.—Translated from the first Latin edition of 1556 with Biographical Introduction, Annotations, etc., etc., by Herbert Clark Hoover and Lou Henry Hoover.—Published for the Translators by the Mining Magazine, London.—For sale by The Canadian Mining Journal, Toronto, Canada.

recognized of the world's professions we shall be amply repaid."

* * * * *

As mentioned above, Agricola spent twenty years in gathering and collating material for his book. It is a workmanlike survey of mining and metallurgy as they were practised in his day. The admirable clarity of his mind, and his equally admirable freedom from the charlatanism, superstition, and sciolism of his age are outstanding qualities. Not the least manifestation of his genius is the facility with which he coins factitious Latin names for implements and phenomena never christened by the Romans. But most interesting of all is the evidence, shown on almost every page, of the fact that the author had the real good of the mining industry at heart and that he had resolved to neglect no manifest detail that might make his presentation clearer to his readers.

**De Re Metallica** is divided into twelve books. "The first book," to quote Agricola's own words, "contains the arguments that may be used against this art [mining], and against metals and the mines, and what can be said in their favour. The second book describes the miner, and branches into a discourse on the finding of veins. The third book deals with veins and stringers and seams in the rocks. The fourth book explains the method of delimiting veins, and also describes the functions of the mining officials. The fifth book describes the digging of ore and the surveyor's art. The sixth book describes the miners' tools and machines. The seventh book is on the assaying of ore. The eighth book lays down the rules for the work of wasting, crushing and washing the ore. The ninth book explains the methods of smelting ores. The tenth book instructs those who are studious of the metallic arts in the work of separating silver from gold, and lead from gold and silver. The twelfth book gives us rules for manufacturing salt, soda, alum, vitriol, sulphur, bitumen and glass."

The author explains frankly that of course he has not fulfilled this enormous task, although he has done his best. He alludes to the large expense to which he was subjected, particularly in the matter of hiring illustrators to delineate the forms of "veins, tools, sluices, machines, and furnaces. . . . . lest descriptions which are conveyed by words should either not be understood by men of our times, or should cause difficulty to posterity, in the same way as to us difficulty is often caused by many names which the Ancients. . . . . have handed down to us without any explanation." This is characteristic of Agricola. His habit of mind was direct, searching, and honest. We shall see other illustrations of this as we proceed. He trusted only to the evidence of his own senses, or to the statements of persons on whom he knew he could rely.

Book I. is in effect a defense and eulogy of "the metal industries." It is replete with quotable passages. So rich is it that only with difficulty can choice be made. First, the author proves the essential dignity of mining. The miner must know something of "Philosophy" (geology), of medicine, of astronomy ("that he may know the divisions of the heavens and from them judge the direction of the veins"), of surveying; of "Arithmetical Science;" of architecture; of drawing; and, of the law, "that he may claim his own rights, . . that he may not take another man's property and so make trouble for himself, and that he may fulfil his obligations to others according to the law." In a word, Agricola defines the qualifications of a mining engineer and defines them well.

Mining, even in the year 1556, had its detractors. Because "scarcely one in a hundred who dig metals or other such things derive profit therefrom," and because others deceive themselves with ungrounded hopes superficial critics damn the whole industry. Agricola rises in protest. Even husbandmen choose carefully their soil and their crops. Care and attention minimize the risk of loss in mining, and are equally necessary. The ignorant and incompetent lose both time and trouble. The informed rarely lose either.

To prove the stability of mining, Agricola instances the gold and silver mines of Schemnitz and Cremnitz that had then been worked for 800 years; while the New Schonberg at Freiberg dated back beyond the memory of man. True, a miner might be disappointed in one vein, but he can always "dig another vein, if fortune does not amply respond to his prayers in the first case." And, though the business of mining may be less reliable than agriculture, is it not, asks he, infinitely more profitable? As for the risks to human life (and they must have been many in those far days!), accidents, asserts Agricola, happen "only in so far as workmen are careless." In like manner is every argument against mining disposed of. The classics are drawn upon profusely in praise of the metals. And to bring the discussion (which includes some really sage advice on mining shares) to an end, it is shown that "certainly, though it is but one of ten important and excellent methods of acquiring wealth in an honourable way, a careful and diligent man can attain this result in no easier way than by mining."

Book II. opens with "more ample information concerning the miners." In the first place "it is indispensable that they should worship God with reverence." It is God's decree, says Agricola, that those who know what they ought to do and how to do it properly, usually meet with good fortune, and *vice versa*. If a man owns a mine himself, he must visit it frequently, even work with his own hands. The diligent workmen are to be praised by the owner. His comings and goings should be announced so that the workmen may not be frightened by his unexpected presence.

With syndicates as with private individuals, the risks of investment should be considered carefully and some person or persons held responsible. And so on. Preliminary considerations such as roads, topography, fuel, timber, water, etc., are touched up, and the outward and visible signs of the existence of veins are outlined. "The forked twig," or divining rod, is given a page or two, and the summing up is one of the best things in the whole book. "A miner, since we think he ought to be a good and serious man, should not make use of an enchanted twig, because if he is prudent and skilled in the natural signs, he understands that a forked stick is of no use to him, for as I have said before, there are the natural indications of the veins which he can see for himself without the help of twigs." Could the whole matter be summed up more beautifully!

In Book III., Agricola discusses "veins and stringers, and the seams in the rocks." Roughly, the fissure vein was the "vena profunda;" the bedded deposit, the "vena dilatata;" the impregnation, the "vena cumulata;" and the stringer, the "fibra." The relation of rock structure to the veins is a matter of discussion. So also is the compass. The book concludes with a dissertation on veins and stringers as they actually occur.

(To be continued.)

# THE CYANIDE PROCESS IN CANADA*

By HERBERT A. MEGRAW, New York.

Cyanidation is a comparatively new process in Canada. Until quite recently, in Eastern Canada at least, the gold and silver production was relatively small, and metals were in the main recovered as by-products from the reduction of base metals. In British Columbia, however, the cyanide process has been employed for some time past in the treatment of gold ores. The utilization of the process to any considerable extent in Eastern Canada was occasioned by the development of metallurgical practice in connection with the treatment of the silver ores of the Cobalt district. These ores, consisting as they do, of a chemical and mechanical mixture of silver with iron, sulphur, manganese, nickel, cobalt, arsenic, antimony and sometimes small quantities of mercury, present to the metallurgist an unattractive combination for cyanidation; in fact, their amenability to such treatment would not recommend itself to one at first glance. Naturally enough, the shipping of the rich ore to smelters and the concentration of the lower grades into a product rich enough to ship, were the first processes in use; but eventually experiments with cyanide solutions were made and now cyanidation is an established metallurgical means of recovering silver from the Cobalt ores. There is little doubt, however, that it has not yet by any means reached its apex of efficiency nor its widest application. In the early stages of application this condition is to be expected and, since the ores present a metallurgical problem which cyanidation in no other instance has been called upon to solve, it is extremely probable that some variations of methods will eventually be devised peculiarly adaptable to ores of this complex character and differing radically from usual practice. Until now methods in the Cobalt district have been largely those already in general use. An exception, however, is afforded in the case of practice at the Nipissing high-grade mill, now well known throughout the metalurgical world, where a peculiar combination of processes is employed and applied successfully in the treatment of extremely rich silver ores. But the method here can scarcely be described as cyanidation, for the greater part of the recovery is effected by the amalgamation. It is nevertheless, an example of the fitting of a process to the material to be treated and as such deserves special praise and study. Presumably the system in use at this mill is familiar to all interested in the subject, but a brief review of its principal features may be permissable.

The ore, the values in which are as high as 3,000 oz. silver per ton, is first crushed dry in a ball mill to a point where it will pass a 20-mesh screen. It is then sampled and stored until required for treatment. The first step in actual metallurgy is the charging of the crushed ore into a tube mill together with mercury, a 5% cyanide solution and pebbles for grinding. The tube mills thus converted into what is practically an amalgamating barrel, with the addition of the grinding feature, unusual in combination with amalgamating systems.

The whole charge thus made is sealed in the tube mill and the machine started. The revolution of this tube at usual speed naturally results in a rise of temperature, and it is possible that this rise might exceed the point of assisting amalgamation and become positively dangerous to successful results but for the fact that it is controlled to some degree by passage through the mill of compressed air, which readily absorbs part of the heat and removes it. It would be natural to expect a large loss of mercury in this procedure, due to "flouring" or "sickening," but it is stated that this does not occur, the loss is not great and is presumably offset to some degree by the small amount of mercury contained as mercury-silver amalgam in the ore.

The action within the tube is probably that of liberation of the metallic silver by the fine grinding and its immediate amalgamation with the mercury, which is maintained in an active state by the temperature and the strong cyanide solution. The latter keeps the mercury clean by dissolving those compounds which when present convert it to fine globules and prevent their coalescence, a condition in which it is known as "floured" or "sickened" mercury. It is undoubtedly true that the cyanide solution thus becomes charged with many elements which it carries into the subsequent treatment. This treatment consists of agitating the now finely ground ore, after the removal of the mercury and amalgam, in the usual way in tanks with cyanide solutions.

As these solutions are used repeatedly it is probable that there is some point where these foreign elements, or a portion of them are removed; otherwise accumulation would result to such a great extent that the solutions would lose their efficiency. The natural place to anticipate difficulty would be in the precipitation department. Zinc shavings are used for precipitation, and it is noticeable that during the passage of the solutions through the boxes a precipitate, light in weight, is formed which does not remain to any great extent in the box but passes through it and settles in the large, quiet area of the sump tank. Analysis of this precipitate has shown the presence of practically all of the elements mentioned as contained in the ore. This occurrence will account for the removal of many disturbing elements, and the fact that the pulp after leaving the tube is diluted with this precipitated solution makes the additional dissolution of silver in the tanks readily understood. In addition to the elements removed in this way from solution, it is altogether likely that some of the elements which are at first dissolved in the cyanide solution will be precipitated as sulphides, due to the large sulphur content of the ore. This will account, certainly, for the removal of some of the mercury dissolved, which will form an insoluble sulphide, and also explains the non-use of lead salts during cyanidation, as is usual in most silver treatment plants, the mercury efficiency taking its place.

The total recovery effected by this combination of processes is said to be about 99%, possibly more at times. The amalgamation is responsible for about 97%, the cyanide recovery being comparatively small, but nevertheless well worth while on account of the extremely high original content of the ore.

The whole scheme of treatment is ingenious and reflects great credit upon the metallurgists responsible for its devising, namely, Mr. Charles Butters, assisted by Mr. G. H. Clevenger and Mr. James Johnston.

Three other Cobalt mines are practicing cyanidation in some form and degree. These are the Buffalo Mines Co., the Dominion Reduction Co., and the O'Brien. The Buffalo uses both concentration and cyanidation, treating by cyanide only the slime formed during crushing and grinding, which is not more than about 20% of

*Read at Ottawa Meeting, C. M. I.

the total ore crushed. About 80% to 85% of the silver contained in this slime is reported to be extracted by cyanidation in the usual form, using air agitation tanks. Steam coils are employed in the tanks to assist solution of the silver, which is a necessary procedure during the cold season and may be of practical utility at other times. The Buffalo company is installing or has now installed an auxiliary plant for the treatment of rich products by a system similar to that in use at the Nipissing.

At the O'Brien mill concentration of the total ore is followed by cyanidation, the usual methods being followed, all the ore being reduced to a point where it can be agitated. At this mill an unusual feature is the precipitation, aluminium dust being used instead of zinc, otherwise the method is the same. The advantages are that one ounce of aluminium dust will precipitate three ounces of silver and that the resulting precipitate can be melted without the use of flux, producing a high grade bullion. As the cost of the aluminium dust is about three times that of zinc the advantage is apparently reduced to the ease and economy of melting, which may be important and which certainly deserves investigation, if it has not already received it.

At the mill of the Dominion Reduction Company a most careful system of concentration before cyanidation is followed.

At the new mill of the Nipissing Company, completed since the writer's visit to the district last autumn, the plant is designed to cyanide ores of lower grade, 25 to 30 oz., without preliminary concentration, other than jigging, making a total slime product, and to make use of some chemical innovations. Chemical improvement is of vital importance to the successful cyaniding of these ores.

In addition to the mills already using the cyanide process, the large number of concentrating plants in operation are producing a quantity of tailing of appreciable value which might be amenable to cyanide treatment in some form. This material being already crushed and in condition for economical handling should yield a further profit. Some chemical improvement by means of which cyanide losses could be reduced and extraction increased would be of immense value.

In this connection attention may be called to the increased extraction of silver at the Tonopah and other silver treating mills by heating the solutions to 120. Also the stress laid by some western metallurgists who are convinced of a notable improvement in extraction by crushing ores in water, removing the water so far as possible, and then applying the cyanide solution. It seems possible that a preliminary application of some solution might result in increased efficiency, and it is certainly worth while searching for a method that can be applied successfully to these ores. The Cobalt ores differ so much from those to which these measures have been applied that it is natural to expect a different procedure in treatment and there is room for further experimentation.

The situation as regards cyanidation is entirely different in the Porcupine district. Here the principal value is in gold which is contained in a quartzose ore, comparatively clean and presenting no metallurgical difficulties. The two mills at present using cyanidation on a large scale, the Dome and Hollinger, are accomplishing the same metallurgical result by two different mechanical means. At the Dome, plate amalgamation is employed to recover the free gold which is in particles too large for dissolution in cyanide solutions within a reasonable treatment time. At the Hollinger this material is recovered by concentration on tables, and subsequent treatment of the concentrate by pan amalgamation. At the Dome mill the ore is crushed in water in order to assure successful amalgamation; while at the Hollinger, crushing is in cyanide solution. It has been found at the Hollinger that very little gold escapes from the tube mills, but, due to its weight, is retained in the tube mill until ground fine enough to be dissolved. This will probably make some change in procedure advisable.

At the Dome mill the water crushing is objectionable on account of the fact that it necessitates the introduction of a large amount of water into the cyanidation cycle, and this must later be discharged with the residue and will then contain considerable cyanide with possibly some dissolved gold. The probabilities are that the amalgamation system is unnecessary viewed in the light of the experience of the Hollinger. Even if it is not, amalgamation may be successfully performed in cyanide solutions, as is done at the Liberty Bell mine at Telluride Colorado, with eminently satisfactory results.

In Canada, gravity stamps appear to be regarded as the only feasible crushing machine. The trend of the time, however, is towards discarding stamps on the grounds of expense and trouble of operation. The writer believes that, in general, other crushing systems are more economical and more satisfactory. Even in South Africa, where the heavy stamp finds its chief advocates, some metallurgists are earnestly recommending a change. Either rolls or Chilean mills, or a combination of both will be found, it is believed, to have advantages aver stamps. It is to be hoped that in the near future some experiments may be made that will determine finally this point.

# CANADIAN MINING INSTITUTE—WESTERN BRANCH

The fourteenth general meeting of the Western Branch of the Canadian Mining Institute was opened at Nanaimo, Vancouver Island, B.C., on the afternoon of March 4. In the unavoidable absence of the chairman of the branch, Mr. M. E. Purcell, of Rossland, who was attending the annual meeting of the Institute in Ottawa, Mr. Thomas Graham, chief inspector of mines for British Columbia, presided.

After a few words from the chairman, Mr. Thos. R. Stockett, general manager for the Western Fuel Co., owning and operating three local coal mines, extended a welcome to the visitors. In the course of an interesting address, Mr. Stockett mentioned that Nanaimo is the oldest coal-mining centre on the Pacific Coast. Before the advent of white men, coal was mined by Indians; the earliest commercial coal mining here, however, was done by the Hudson Bay Co. While coal was found at Nanaimo in 1849, it was not first mined in a systematic way until 1852, but mining had been continued there ever since. As stated, the first operator was the Hudson Bay Co., which, a few years later, sold the Nanaimo mine to an English company, the Vancouver Coal Co., which was reorganized in 1899 as the New Vancouver Coal Co., while in 1902 the Western

Fuel Co. acquired the property. Coal was reached in No. 1 mine, known as the "grand old mine of British Columbia," in 1883, so that mine had been operated for 30 years. To-day there is as much coal in sight in that mine as has been taken out of it, so it is difficult to prophesy what its future will be. During the past month a record was made of 1,700 long tons in a single day's hoist, while the average daily output for the week had been 1654 tons. On a similar basis, working 300 days in the year, an annual output of half a million tons could be made, and it is thought the days for such a production are not far distant. The company is now opening a new mine, known as the Reserve Shaft, on an Indian reserve four-and-a-half miles from its shipping docks, where there is a splendid bed of coal at a depth of about 1,000 feet, which will shortly be reached by the shafts now being sunk. This mine is being equipped for an output of 2,000 tons of coal a day. Mr. Stockett mentioned, further, that the company takes a deep interest in everything tending to the safety of the men in its employ. Mine rescue oxygen breathing apparatus was provided by the company and men trained in its use before the Provincial law requiring this protection for the men was enacted. The local Mutual Improvement Association, established by the company's mine employees for the discussion of mining subjects, has been encouraged; also every assistance has been given to Mr. F. Napier Denison, of the Dominion Meteorological Office, to carry on investigations and make observations in the mine, in connection with his theory that there is relation between earthquakes and earth-movements and mine disasters. Information was also given showing the low death rate in the company's mines.

After the chairman had made reference to the assistance and co-operation given so readily by the United States Mine Rescue Training Station officials at Seattle, Washington, prior to the establishment of the local mine-rescue corps, an interesting and instructive paper was read by Mr. Geo. Watkin Evans, of Seattle, on the Groundhog coal field in the northern part of Skeena district, British Columbia, in which field Mr. Evans spent the summer of 1912 examining coal lands for clients. A series of lantern slides showed the rough topography of the country, and in some instances the nature of the rock formations.

A paper on "The Best Methods of Mining Coal Under Various Conditions," prepared by Mr. Alexander Sharp, of Vancouver, B.C., for the annual meeting, Ottawa, was, by the courtesy of the secretary of the Institute, presented. This was one of several Mr. Sharp had undertaken to prepare; it dealt largely with longwall mining, and in it were references to the conditions in parts of the Nanaimo field, Mr. Sharp having been manager of a local coal mine some years ago.

### Tuesday Evening Session.

On Tuesday evening, the proceedings were opened by Mayor Shaw officially welcoming the Institute and its guests to Nanaimo, and then at some length reviewing the progress of the coal mining industry of the province, besides giving information concerning coal mines on Vancouver Island.

Mr. Henry Clark, M.I.Min., E., Canadian manager for Head, Wrightson & Co., of Stockton-on-Tees, England, colliery and mining engineers, next read a paper on "Modern Surface Equipment of Coal Mines," in which he gave a review of his work and experience in connection with the surface equipment of collieries in different parts of the world. He dealt with head-frames, pulleys, keys, cages, simultaneous banking, safety devices on cages, air-boxing for upcast shafts, safety detaching hooks, patent tipplers, mining cars, screens, picking belts, horizontal screens, coal-washing, storing and shipping coal, maintenance, etc. The address was illustrated by numerous landern slide views, some of them showing bankhead equipments as a whole, and other details of construction, etc. In addition several models were shown. The address was well received and many questions were asked and replied to at its close.

### Wednesday's Proceedings.

On Wednesday morning a visit was paid to the new Reserve Shaft mine, under the guidance of Mr. T. R. Stockett, general manager; Mr. Thos. McGuckie, general superintendent, and Mr. A. S. Hamilton, master mechanic. Both of the new shafts are 10 x 26 feet in the clear, divided into three compartments—two for hoisting and one for air. Each has an area of about 100 square feet, and in this connection it was pointed out that it is unusual to have the air shaft as large as the main shaft. Hoisting engines, which were installed shortly after sinking was commenced and since used in this work, were made by Andrew Barclay & Sons, Ltd., Kilmarnock, Scotland; that for the main shaft is 30 x 60, with 14-foot drums, and that for the air shaft 20 x 54, with 12-foot drums. Both are provided with all the latest known devices for preventing overwinding, checking speed, and automatic closing off if the hoist engineer be neglectful or disabled. The Canadian Rand compressor is compound steam, compound air, 2,500 cubic feet capacity. Two h.r.t. boilers 84 in. x 16 ft., each with 104 4-inch tubes, generate steam; four more will be added to make the full battery. A double Sirocco 90-inch fan is being put in, capacity 400,000 to 500,000 cubic feet of air. The standard gauge railway from the mine to the company's shipping docks crosses the Nanaimo River near the mine on an overhead Howe truss bridge having two 150-ft. spans, with centre pier; this bridge has been built strictly in accordance with the requirements of the Railway Act of British Columbia. The total expenditure to date on railway, shaft-sinking, machinery, etc., has been approximately \$500,000, and it is estimated that it will require a further outlay of fully \$300,000 to place the mine in condition to regularly maintain the projected output of 2,000 tons of coal a day.

After lunch the party was taken in the company's launch to Malaspina's Gallery, a striking natural grotto or balcony cut out of the sandstone rock on the northwestern shore of Gabriola Island by the action of wind and wave, more than 100 feet long by about 10 feet wide. Capt. Alexandro Halaspina, an accomplished Italian navigator, in the service of Spain, is stated to have discovered this natural phenomenon when hereabouts in 1791, engaged on an expedition of survey and discovery. He went as far north as Malaspina Glacier in Alaska, between Mt. St. Elias and the sea, the glacier having been named after him.

### Mine-Rescue and First-Aid Work.

On Wednesday evening Mr. J. F. Menzies, general superintendent for the Northwestern Improvement Co., of Roslyn, Washington, U.S.A., gave an address on mine-rescue and first-aid work, and he was followed by Mr. P. B. Ashbridge, St. John Ambulance Association instructor in first-aid work to the Canadian Pacific Railway employees west of Winnipeg. Mr. Matthew Gunness, of the local Mutual Improvement Association, read a paper on "Mine Accidents and How to Prevent Them." Instructive discussion ensued on each of these subjects.

During the evening the chairman, Mr. Graham, who before he became chief inspector of mines was general superintendent for the Western Fuel Co., stated that the company has sixty-five "graduates" trained in the use of mine-rescue apparatus. In the Province of British Columbia there are now eighty-eight sets of oxygen breathing appartus—49 two-hour Draeger, 30 half-hour Draeger, and 9 Fluess. As there are 7,130 persons employed in the coal mines ,this gives one for every 81 persons employed. Fatal accidents in coal mines in British Columbia during the last three years had been: In 1912, 3.93 per 1,000; in 1911, 2.32 per 1,000; in 1910, 3.61 per 1,000. The lower ratio in 1911 was due to the fact that during about seven months of that year most of the coal mines of the Crow's Nest Pass were inoperative, owing to a strike of the miners, the quantity of coal produced that year from those mines having been 800,000 tons less than in 1912. For a 10-year period, 1903-1912, the death rate had been 5.078, atributable to—falls of roof, 6 (21.43 per cent.): falls of coal, 3 (10.72 per cent.); mine cars and haulage, 9 (32.14 per cent.), and 18 (64.32 per cent.); explosives 7 (25 per cent.) miscellaneous, 3 (10.78 per cent.). Seventy-five per cent. of the accidents—caused by falls of roof and coal land hauluage—were avoidable, and were due to negligence on the part of those directly affected, or to lack of discipline of officials. Mr. McGuckie gave particulars of the progress of mine-rescue training at Nanaimo.

Before adjournment, Mr. E. Jacobs, secretary of the branch, heartily thanked those who had taken part in the varied and interesting program, especially the visitors from the State of Washington, and, to Mr. Stockett and the other residents of Nanaimo who had co-operated to make the meeting the distinct success it certainly had been.

Adjournment was then made to another hall where Mr. Stockett had provided supper for between 100 and 150 present, and this was folowed by a smoking concert, the excellent program of which was carried out chiefly by employes of the Western Fuel Co.

## MORE POETRY

[Note.—The following verses were written by Mr. A. S. Hamilton, master mechanic for the company, and read by him at a banquet of the officials of the Western Fuel Company, Nanaimo, Vancouver Island, British Columbia. While the occasion referred to was not in the immediate past, the sentiments expressed are live ones to-day, as they were when the writer of the verses first read them.]

—o—

**Response to the Toast—"The Surface Department."**

In looking around me for something to say
In response to this toast;
I'm hoping to utter no language that may
Look to you like a boast;
For rather, I think, do we surface men feel,
That here on the Tqp we've the best of the deal;
We're content to be reckoned a spoke in the wheel,
A unit at most.

But just for a moment we ask for your ear,
Since we're in the act;
And would like to remind every mining man here,
With tenderest tact,
That though we don't share in the strenuous pace,
That exists down below in your hell of a place,
The troubles don't end when coal leaves the face;
And that is a fact.

According to what the geologists say,
It duly appears,
The coal has been formed and hidden away,
For millions of years;
And often we feel that their theory's right,
It so clearly explains why the coal it takes fright,
And balks just as soon as it hits the daylight,
And this valley of tears.

Now everyone knows just how fractious it gets,
And how eager to shine.
Though we handle it just like a child in the pets
All to hold it in line.
When we read of its energy, bottled and pent,
And its frantic ambition to find a clear vent,
We're ready to swear that the most of it's spent,
Right here at the mine.

How they manage at 'Frisco there's few of us know,
And less of us care,
For long before they have their troubles below,
We've had our share.
From the foot of the shaft to the ship at the dock,
'Tis nothing but one constant stubborn balk,
And it often exhausts all the patience in stock,
And would more if it dare.

Yet do not assume that as martyrs we pose;
We make no such appeal;
We're paid for our work, and as everyone knows,
That's all in the deal;
But to-night we make bold to present to your view,
A blue-jumpered, plain-looking chap in our crew,
To whom we feel certain your homage in due;
The man at the wheel.

He stands at his throttle from morning till night;
You ne'er saw him flinch;
And the swift plunging cages that're hid from his sight,
He'll land to an inch;
The big creaking drums that would like to run wild,
He handles them just as a woman her child,
And they know he's the boss; but though usually mild,
He can hurt in a pinch.

In the morning he tests every lever and screw,
Each cotter and pin;
And he makes them all swear they will stand by him [true,
Through thick and through thin.
The turbulent parts of his monster machine,
He pats on the back—though he lectures them keen,
While the big, sombre dial stands watching the scene
With satisfied grin.

By a curious blend of coincident law,
And mechanical rules,
His nerve is of steel and as free from a flaw
As the lever he pulls;
And you step on the cage with a confident air, [care;
And, without the least thought, place your life in his
You instinctively feel that you're safe while he's there,
At the end of the tools.

His mind is spring-loaded and ready to pop,
If the least thing goes wrong;
He'll spring like a trap should the signal to stop
Be flashed on his gong;
Yet, though he lives under this tension and strain,
And an air of excitement envelopes his plane,
The power of control, and command of his brain,
Looms up in him strong.

From the manager down we may all make mistakes,
Strange as it may seem;
Yet we may o'ertake them without any aches,
Or the loss of a dream;
But the man at the hoist must have never a trace,
Of an error, no matter how strenuous the pace;
And this truth alone should command him a place
High in our esteem.

We're obliged for your toast and 'tis pleasant to know
That we have your goodwill—
May the sentiment mutual continue to grow
While we grind at the mill;
And when in the future we socially meet,
And extend to each other those compliments neat,
We humbly request you to take from your store
Of greetings and wishes one little cup more;
An extra kind whisper of praise in the ear,
A bumper that's bigger and fuller of cheer,
The pleasantest smile you may have at command,
The kindliest, friendliest shake of the hand,
Your nicest "good day" and encouraging smile,
A clap on the back of your jolliest style;
And shower them, along with the thanks of your wives,
On the man who so faithfully handles your lives;
He's the King of the Surface Crew, Boss of the Kit,
He's the muscle and nerve, he's the man with the grit;
He's the Prince to whom each of us raises his cap,
That dungareed, blue-jumpered, plain-looking chap—
THE MAN AT THE WHEEL.

# NOTES ON MINING AND TREATMENT OF GOLD ORES

**By R. B. Lamb, Toronto, Ontario.**

(Written for the Canadian Mining Journal.)

In this paper I shall attempt to discuss broadly mining methods and metallurgical processes employed for the extraction and treatment of gold ores during recent years, and to indicate some probable lines of progress in the immediate future.

I shall not, of course, undertake an exhaustive treatment of the subject, but shall touch only such as appear to me salient points illustrative of evolution.

Gold is wisely distributed in nature in small quantities. On account of the scarcity of the metal, its resistance to oxidation, and its attractive colour, the miner has always favoured its exploitation.

Owing to the small weight of gold in a ton of material and in some instances to the difficulty of separating the metal from the gangue, special care is required to mine and treat the ores of gold without undue losses of metal. Exact metallurgical methods have been demanded and these have induced the creation of a body of technical men, who have learned to manipulate with a high degree of scientific skill.

In gold recovery, we are not so much interested in the percentage of extraction, as in the value lost in the tailing. Percentages may be misleading; tailing-values never.

Throughout the ages mining for gold has been one of man's favourite occupations. As civilization advanced and man marched industrially onward the business of gold mining became more and still more defined, until now it has assumed all the dignity of a recognized commercial undertaking, directed by scientific thought and means. But mining for gold is now, or should be, only undertaken by those who are qualified. It cannot be too often repeated, that the only opinion worth following on a gold problem—either mining or treatment—is the opinion of one trained for that purpose, namely, a mining engineer.

Engineers may differ in attainments, in training and experience; nevertheless, advice by the trained official of the problems at hand is the only direction that money, time or thought should be risked upon.

We are now at a time in the history of gold mining when we must not deal with the fantastic ventures of the promoter as with the industry of gold mining. We must only consider real mining and ore reduction.

A large part of the world's gold supply has been recovered from placers and gravel deposits of various kinds in which gold is present in the metallic state, alloyed usually with a little silver. It occurs as gold dust or grains and nuggets of varying sizes, but rarely exceeding a few ounces in weight. Gold obtained by hydraulicking or dredging is much finer than that from other gravel mining and can be readily saved.

In earlier times and still within the memory of the living, gold from the shallow deposits was recovered by washing with hand appliances, sometimes with the aid of a horse or mule. The machines used were crude and simple—generally made on the claim.

The shallow placers of Australia and America, for instance, were a boon to the miner without capital and were quickly and inexpensively worked. High recoveries were made with the simple hand appliances readily fashioned on the ground. Thus, the easily worked shallow deposits quickly disappeared and gravels, which contain only a very small amount of fine gold, are left for subsequent working. Obviously, to render these profitable, machinery for the preparation of the deposits for removal on a large scale was necessary. Thus, we find shallow placers and rich gravels, which were, at one time, very profitable to hand methods, are now exploited by hydraulicking and dredging.

Another type of workings, called in Australia "deep leads" and in California "drift mining" (generally an old river channel covered by rock formation) demanded special mining. When the gravel taken from these deposits has been brought to the surface, the separation of the gold from the matrix is as simple as with shallow placer mining.

Much of interest might be said and written on placers and deep leads and other gravel deposits carrying gold; but as the methods employed are comparatively simple and well understood, and as these deposits in the future will probably be much less important than at present, and still less important than lode mining, we will pass on to gold obtained from ores in vein mining.

Gravel mining, which is probably the simplest of mining, has called to its aid electricity and mechanical appliances used in hydraulicking and dredging. Gravels with a low-grade gold tenor offer to-day principally problems of moving material. Their exploitation is an engineering problem either of conveyance of material in large quantities by mechanical means, or by the agency of water. From whatever view point we look at gravel work, except deep lead mining, the question calls for an engineer to work out the following problems: To prepare the deposit for removal and remove it; to wash it to recover the gold; and to dispose of the tailing. The actual extraction of the gold from the gravel matrix is a matter so simple as to call for no special comment. In all rich placers and gravels, Nature has really mined the ore and placed it in defined channels or beds, concentrating the gold during deposition and rendering its removal and recovery easy and inexpensive. When the rich shallow gravels are worked out, the opportunity of the ordinary working miner to make gold mining a profitable business disappears, and the skill of the trained operator is required.

The production of gold from vein mining, on the other hand, has been steadily increasing during the past ten years and for the year 1912 we have the largest production from vein mining on record. This has been due to several causes. A large factor is the discovery and intensive exploitation of the deposits of the Transvaal. The real cause, however, appears to me to be that many deposits are of such nature that in order to return an adequate profit on the capital invested, operation on a large scale is compulsory. We have before us the evidence of a number of years of gold mining, showing that the early vein discoveries of importance were comparatively rich in gold and of limited tonnage. These were easily worked with small plant and little capital was required to return big profits on the investment. As the rich veins which were easily found (such as those of Australia and California) became worked out, larger deposits of lower gold tenor were developed and brought to the producing stage; hence, large combinations of capital involving greater development ahead of reduction processes became the practice. The development of a gold prospect, where a small amount of capital will put it on a producing and profitable basis and where the mine can be further exploited and tonnage and production increased out of profits, is a rare occurrence now. More comprehensive study and greater development with a view to blocking out tonnage ahead of a proposed reduction plant are essential factors in present day gold mining. It is becoming increasingly more difficult to mine in a small way. Capital is not attracted by small tonnage.

In the early days of California and Australia the type of ore deposit known as "free milling" best illustrates the simpler kind of vein mining for gold. In both these countries we have quartz veins carrying free and visible gold together with a small percentage of sulphides with which gold is associated. The outcrops of many of these veins were very rich and the gold readily obtained by free milling practice. The ease with which the gold was recovered and the handsome profits from operation rendered the early industry full of fascination and romance. It also retarded progress in the development of mining methods and metallurgical processes. Perhaps if we consider mining methods adopted in the gold fields of Victoria as an illustration, we will be better able to compare methods then used (and to some extent still used) with more modern methods, for instance in the west of Australia and in Mexico.

In Eastern Australia, particularly in the gold fields of Ballarat and Bendigo, when opening up a new prospect, sufficient ore is developed to justify the erection, we will suppose, of a five or ten-stamp mill and to keep it employed for about a year. If the prospect subsequently developed further ore, the mine would build itself up out of profits from this small beginning. If the property failed to develop more ore, another idle plant gave testimony to indifferent methods and shareholders were not compensated for the risk they had taken. These methods are still in vogue in the State of Victoria, although some of the more experienced operators are now convinced that it is better to develop the mine, and, as far as possible, determine what the probable life will be before building a reduction works. Old methods of stoping and handling ore underground still prevail in most of the mines. While the work accomplished is well done and the mines are worked with due regard to the safety of the workmen, they still lack the progressive spirit calling for the installation of improved equipment. Most of the mills at Ballarat were, seven or eight years ago and some are still, fed by hand. I remember when the first automatic feeder was put in a stamp mill in the Ballarat gold field. This serves to illustrate the backwardness, in some respects, of the early historical mining camps. Western Australia employed automatic feeders before many important camps in Eastern Australia would tolerate them. The splendidly trained miner of Eastern Australia in performance was ahead of his somewhat less skilled brother of Western Australia. To make up for the difference in men, machinery was generally utilized in Western Australia. This is well illustrated by machine drilling. While Eastern Australia is now employing air compression and rock drills for both development and stoping, a considerable time elapsed after the successful introduction of these methods in other parts.

The old time manager of the camp at Ballarat had a distinct prejudice against rock drills, without proper means of determining the cost between hand and machine work. He insisted that machine work was costlier than hand work. In a way, the eastern miner was right. If machine work had been introduced into eastern mines without compensating progressive introductions in other parts of the work, machine drilling would have been costlier to the eastern industry; but machine drilling once established, with all other parts of the mine working in harmony, as since adopted, has unquestionably proved more profitable to the mine owner in both eastern and western camps. Eastern Australia approved of the methods of the old practical miner and his management was the dominant factor in the operation of the mines of the principal gold fields of the country. It has not even yet escaped from the older methods. The technical man has not had a free opportunity in Eastern Australian gold camps and as a result, reliable cost data are not frequently dealt with. On the other hand, Western Australia and parts of Northeastern Australia have come under the influence of investors demanding direction by experienced engineers so that newer and better methods prevail, especially in the transportation of ore and delivery of ore from stopes and other mine workings.

Work under the old methods of Eastern Australia as stated before, is on the whole well done, and very cheap work in many places is accomplished; but through lack of the guidance of the trained engineer, this work is done on propositions that frequently do not warrant the expenditure of such energy. Yet Western Australia is fruitful in instances of the advancement of gold mining methods, particularly the application of mechanical agencies to the treatment of gold ores.

The writer was in Kalgoorlie during the period of its most interesting development and took part in the metallurgical work of the time, as well as having the opportunity to study the work of other engineers in the same field. I remember the early worries of the Kalgoorlie metallurgist when tube milling and filter pressing were first introduced. Despite all the first troubles of slime settlement, classification, etc., this was probably the greatest school of metallurgy we have ever had for gold.

Mechanical progress kept pace with chemical methods, nor were underground operations lost sight of. Kalgoorlie alone was responsible for the early success and the adaptation of filter-pressing and tube milling to the treatment of gold ores, and, as far as I know, this camp was the first to dispose of the tailings from filter pressing for stope filling. The disposal of this residue was accomplished by mechanical means with the aid of belt conveyers and was a distinct step in advancement over old methods. The utilization of tilting furnaces in bullion refining was another step in the progress of the metallurgy of this camp.

The refractory sulpho-telluride ore of this region were high-grade, and suitable smelting facilities did not exist. The mine operator was faced with a situation, underground and above ground, of this nature. Underground, owing to the friable nature of the valuable mineral in the ore, careful mining was necessary. The magnitude of the ore bodies rendered extensive mining desirable and the lack of a convenient smeltery rendered treatment on the ground imperative. Kalgoorlie, therefore, was a distinct factor in the advancement of Australian mining methods and metallurgical processes. It was the pioneer in the treatment of refractory gold and of gold-silver ores. The mining world owes an immense debt of gratitude to Kalgoorlie. The high price of labour and the difficulties of desert operation rendered the mechanical handling of ore and tailings absolutely necessary, and the scarcity and poor quality of water emphasized the necessity of improving slime settlement, they pointed the way and made it possible for brilliant investigators in the United States and Mexico to reach the present state of high efficiency.

The Rand, on account of the depth and extent of its ore deposits, taught the mining world much in the way of handling ore and developing and blocking out ore reserves far in advance of milling operations. While attending to this problem the Transvaal rested content with the metallurgy of gold as worked out by earlier practitioners, and it was not until Kalgoorlie had demonstrated the value of more progressive methods that the Rand began to adopt these measures.

The gold tenor of the quartz veins of Eastern Australia is now generally so low that further improvement can hardly be expected until operators will introduce more progressive underground methods. Stoping systems that will eliminate to a much greater extent the shovelling of ore than is in use to-day and more up-to-date methods for handling ore underground will have to be employed before further cost reduction can be expected. The principal reason for marking time is the high quality of underground labour and the comparatively low price of this labour. This held back the introduction of special machinery, and the employment of technical men who would, in many instances, have adopted different mining methods than have been employed.

California, on the other hand, probably due to the love of Americans for mechanical devices and the close contact with other mining regions of America, adopted mining schemes that were a mixture of the older ideas and of newer progressive methods. In parts of California, splendidly equipped and well managed mines with good methods are found, and at other properties, we find deplorable methods and bad operation.

It is noteworthy that both the State of Victoria and the State of California were responsible for the development in the chlorination process. This process was evolved for the treatment of sulphides obtained from concentration of the quartz ore found in these regions. Australia (particularly the camp of Ballarat) in the development of the chlorination industry gave to the world the splendid Edwards roaster, which is now used throughout the mining regions. The chlorination process was the first chemical process to give decided satisfaction to the operator. It has since been supplanted by the cyanidation process—not because the cyanidation process is more thorough in its chemical work, but because the cyanide process is easily to operate and cheaper in cost. While we may not have much use for the chlorination process in the future, no words can express the value of the process to metallurgy as pointing the way to exact chemical manipulation for gold ores.

It is important to point to the fact that the State of Colorado has some examples of both the worst and best practices in gold mining. Probably no other state in the American Union has offered to the world a greater variety of ingenious appliances for use in gold mining and metallurgy than Colorado, and it is a matter difficult to explain why this state has supplied methods and machines for a country like Mexico right up-to-the-minute in progress, and suffers operations within her own borders, which are both crude and unscientific.

The dawn of modern methods began in Australia with the treatment of the immense heaps of tailing accumulated from the mills of the fifties, sixties and seventies. Eastern Australia with its tailing heaps developed the chemical side of metallurgy and Western Australia with its desert difficulties developed the mechancial side of metallurgy. The result was a highly efficient body of trained men. These men were available for other service as soon as the great tailing heaps had disappeared. Most of these accumulated tailings of Eastern Australia carried a considerable portion of sulphides which were oxidized by exposure to the air and complicated chemical salts resulted from weathering. To obtain the solution of the gold by cyanide before its destruction by the salts of iron and to do this at a low cost, sharpened the minds of those in charge and was responsible for an evolution that those engaged in the work look back upon with the fondest recollections.

The writer was one of the first engineers in the State of Victoria engaged in cyanidation and it is interesting to recall the fact that as our literature was meagre and opportunities for studying practice almost nil, operations, particularly those of refining, were largely a matter of conjecture.

We attempted to roast zinc-gold slime in diminutive iron trays in F Battersea muffles, and we tried to treat the slime with acid in a ten-gallon hogshead. Needless to say, our early attempts were terrible failures. Precipitation by charcoal was invented and utilized on most of the accumulated tailings plants in the State of Victoria. The reason of this was the large amount of caustic soda that was necessary to neutralize acid salts. The charcoal method of precipitation worked extremely well and was a very efficient method of gold precipitation for the special conditions in that State. The accumulated tailings were a mixture of sand and slime (usually a large percentage of slime). I think that it was in Victoria that the shallow vat of great diameter was first introduced and I believe I am right in stating that the plant erected at the Black Hills mine near Ballarat had the shallowest and greatest diameter vats of the time. The depth of sand was four feet and the diameter of the vat, if I remember correctly, was forty feet. The solution was applied from either two or four points at the circumference of the tank and flooding rapidly effected. Excellent extractions were made with these plants and the resulting profits gave adequate return on the investment. Many difficulties were experienced, as I have indicated, at the start. The principal troubles were due to the acid salts of iron causing a high cyanide consumption and the difficulty of percolation through the high percentage of slime. The initial high consumption of cyanide rapidly fell to small amounts and there are nstances of practice in Australia where a consumption of only four ounces of potassium cyanide per ton treated is recorded. Even at this late date, no better examples of extractions are given than some of those made on the accumulated tailing piles in the State of Victoria.

I wish to refer again to mining methods further to illustrate the effect on treatment in the State of Victoria and other places. I know of no better illustration for this purpose than mining on the Eastern Australian quartz veins. The conditions that prevailed there, namely, the high efficiency of the mine labour and the length of time before more modern machine methods were introduced in underground work had profound effect on the actual ore treatment. The manager watched stoping operations closely and the ore was always broken clean, as little as possible of unprofitable vein matter or wall rock being broken or mixed with the ore. Generally the ore was broken and cleaned out of the stope and then filling put in and stoping again continued; the ore going to the mill was handled carefully at all points on the way. The actual breaking of the ore was carefully regulated by frequent pannings from the faces; little or no assaying was done. As a rule, the manager was successful in delivering to his mill a very clean ore of fair gold tenor and the free milling nature of the ore resulted in high development of stamp battery amalgamation. I know of no place where so much efficiency is obtained from amalgamation behind a stamp battery as in the State of Victoria. The tonnage milled was also reasonably high. Having an ore readily amenable to amalgamation and much care being given in mining and amalgamation to this ore, we find that of all the ore mined in the State of Victoria the greater bulk of it made such a low-grade tailing that it proved unprofitable to re-treat it by any process. To-day the immense accumulated tailings of Ballarat and Bendigo stand as lasting testimony to the efficacy of the treatment throughout. The principal aim of the miner there was to extract as much as possible of the metal from his ore and not to regard tonnage as so vitally important.

Since air compression, machine drilling and, improved stoping methods were introduced, the same care in breaking ore has not been given. Indeed, it is not possible to break ore as clean by machine as it is by hand. On the contrary, methods of milling and of crushing and subsequent for metal extraction have advanced and progressed in such a way (so to speak) as to counterbalance the dilution of ore by hastier stoping. "Dirty" ore is to-day largely counterbalanced by the rapid and cheap ways we have for conveying and moving ore in the mine, around the mine, and through the mill. Modern mills are more concerned with handling tonnage cheaply. The old mill was erected to dress well. The new mill is designed to work quickly. We are now enabled, by chemical and mechanical progress, to dress both quickly and well. It is, therefore, really the progress in modern ore treatment that has made it possible to mine quickly and cheaply, simply because we are able to extract the metals cheaply and well, and dilution of grade between limits becomes less vital than formerly. The best example that can be given in proof of this is to take the records of progress of the camp of Kalgoorlie and the camp of Cripple Creek, Colorado, where refractory telluride bearing ores are being handled at a remarkably low cost with splendid results. Moreover, this progress is not stationary, but each year shows a great advancement on the methods of the year prior. Kalgoorlie is now treating profitably ore that has a gold tenor of only $6.00 to $7.00 per ton. Another splendid example of practice is Mexico. Mexico is awakening—not because new mines are being found, but because the mines of a decade ago were worked to the point where hand methods were no longer profitable. Side by side in Mexico, we have mines, some of which savour of antiquity and other which are examples of the most progressive methods in gold or gold-silver mining in the world of to-day. Mexican mining has been vitalized by electricity, belt conveyance of ore, Kalgoorlie methods of treatment and American methods of mining.

It is only during the last ten or fifteen years that mining engineers as a body have become cosmopolitan, moving actively around the world, exchanging ideas, adopting and varying the practice of different countries for different situations. We must realize that on mining section usually develops one thing well and to get the best of everything we must adopt ideas from the different practices of different countries. I think this development is best shown in the gold mines of South Africa and the gold-silver mines of Mexico.

A note of warning should be sounded here. We can be too progressive without experience. Engineers will adopt or try to adopt the newest practice for a budding proposition, not having experience or familiarity with all branches of that practice. The result is frequently a costly experiment. Time and money will rectify the blunders of this unbaked maturity. Meanwhile, some of the mine's ore reserves are wasted.

A relation between mining and metallurgy that is becoming more appreciated is the proper mixture of the ore prior to treatment. I remember a mine, twelve years ago, at which stamp milling was followed by amalgamation, and subsequent treatment of the sand and slime by cyanidation was practiced. The ore was quartz carrying gold and a small percentages of iron pyrites. In the ore shoot (pitching at a low angle through the vein) was a streak higher in sulphides than the remainder of the body. This streak carried a little bismuth as carbonate. In the early operation of the mine little attention was paid to this streak and the ore was sent to the mill without regard to it. On some days ore carrying a comparatively large percentage of bismuth was milled, and then probably for several days no bismuth would be encountered. The result of this practice was that the bismuth, being a mineral of high specific gravity, clung to the plates, affected the amalgamation, and bothered the cyanide treatment. By properly mixing the ore, however, and keeping the amount from the sulphite streak as regular as possible, the mill men knew exactly the conditions confronting them and extractions were much improved.

An important feature of the relation between mining and milling is that of ore reserves to the capacity of the reduction plant. More failures are made in gold mining through too much and too early construction than from any other cause. It is necessary, for proper mining, that the construction-metallurgist should be in a position to check and verify ore reserves before plant design and erection. This factor controls the size of the plant for the developed ore.

However, a more important relation between mining and milling is that of life-expectancy. It is here that the highest skill of the engineers and managers is called into play. Most operators to-day, and all engineers, realize that to establish ore reserves and have a knowledge of future possibilities is of the very highest importance before designing and erecting a treatment plant. In many places and in a large number of important mines there is an interfering influence between mining and milling observable. I refer to the independent departmental management of a number of properties. It is highly important to have defined and properly correlated departments, each working systematically under the direction of a competent manager or engineer, but it is the height of absurdity to make such departments self-operative. Examples of this practice could be multiplied. Its effect can be more concisely realized by pointing to a few interfering factors.

We will suppose that we are dealing with a refractory ore which calls for cyanide treatment for the recovery of values, and we will suppose that there are interfering minerals, as for instance, maganese, bismuth, iron and copper salts irregularly distributed through the orebody. The metallurgist knows perfectly well that by proper selection of his ore he can cause beneficent reactions to take place during the treatment which will assist and render his operation more satisfactory and less costly. If such a mine were being operated on the departmental plan, the underground manager would have little regard for the work of the metallurgist but would conduct his operations to show to the best advantage for himself. The metallurgical end of the venture would probably prove costly, extractions would no doubt be low and irregular. Again should concentration be one stage in the treatment that is adopted, with the sensitive machinery now employed more labour would be required to control and regulate the machine due to the variation of mineral content. This would result in higher costs, lower extractions or both. Should mechanical difficulties to experienced in the mill and the underground department desire to show a greater tonnage and low cost, the mill would be handling more ore than should be properly treated and the metallurgical end would again appear at a disadvantage. It is needless to illustrate this further. The idea is apparent. We realize today that the best results can only be achieved on large propositions by departmental management working in perfect harmony through an executive engineering head. After all, this is the chief function of a high-class manager.

I cannot do better than conclude this brief review by giving the substance of what I had written two years ago. Metallurgy may be defined as the art of extracting metals from their ores and preparing them for the use of the manufacturer. It will, therefore, be understood that there is no plant or part of the equipment upon the surface of a mine that is not directly or indirectly connected with ore reduction. It should be understood that the surface equipment cannot be divorced from the mine equipment, and, therefore, the cost relationship between mining and metallurgy is the most important relationship of all because it is upon proper methods of cost keeping and distribution of charges that we are enabled to affect improvement and guide the operations of the mine. It will be recognized that it is impossible, in many cases, to separate absolutely the costs in one department from their bearing on the costs of some other department. Again, there is a close relationship between mining and metallurgy on the operating record sheets that are used to direct and control different departments. While we can benefit by the experiments of other countries, we can only use them as a basis of our own work

If an individual undertook the manufacture of shoes it is hardly likely that he would begin the process until he had obtained competent workmen. Why, therefore, should those incompetent to mine and treat ores undertake the extraction and reduction of these metals? It is clearly a matter for experts. Imitation has never fully solved any problem and never will. We must largely replace imitation in our practice and business methods by experience, and only take what, in the judgment of men trained in the business of mining, is thought to be suitable for the problem in hand. It must be realized, that every mine, no matter where situated, has its local conditions and local requirements and it is only by skill that these requirements can be successfully met. Every mine and metallurgical problem is distinct and depends upon the individual ore and on the particular chemical and physical characteristics of this ore. While the general design and mode of operations of any reduction works may be to all appearances similar to the mill adjoining, the operating metallurgist will have to use his brains to meet local requirements in his daily manipulation inside of the mill.

We have arrived at a state of mine equipment that would astound the forty-niner and we are triumphantly marching to a metallurgical goal that a few years ago was not contemplated. We are evolving the continuous treatment process, and few yet realize what this means for the future. An ideal process would be one which could treat ore without men and without supplies. We have not eliminated all the men yet, but they have been reduced over 50 per cent. in the past ten years. The consumption of supplies also has correspondingly diminished. There is no doubt that the matallurgical chemist will succeed in further reducing the present consumption of material.

In this brief review it is impossible to allude specifically to the splendid work that has been done in the various modifications of the cyanide process, and to enumerate and describe the different appliances that have been brought together to affect this evolution. It is unnecessary to describe the mining systems in use throughout the world for the extraction of gold ores, but the time is not far distant when we will have done with the stamp mill and all machines depending on the close application of an individual for their successful operation. We will simplify mills as we have simplified and improved underground systems. We will treat ore more cheaply than now, with fewer wheels and with less complication. Only recently we have witnessed the application of machinery to underground systems, the improvement of stoping methods, and the elimination of much physical drudgery. The wet treatment of refractory ores has been successfully accomplished. We are now facing simplification of plant design.

# THE OCCURRENCE OF PYRITES IN CANADA

Notes from the Report* of Dr. Alfred W. G. Wilson.

## PYRITES IN THE MARITIME PROVINCES.

Provincial reports and the reports of the Geological Survey of Canada contain many references to occurrences of the mineral pyrites in various localities in the provinces of Nova Scotia and New Brunswick. The writer has not been able to find any record of the mining of pyrites on a commercial scale at any locality in either of these provinces. In a few instances sample shipments have been made, but these were made many years ago, and the ore was valued for its copper content only.

The pyrites occurrences in the province of Nova Scotia, so far as the writer is aware, are not known to be large enough to be of commercial importance.

In the Province of New Brunswick, in the parishes of St. Stephen and St. David there are a number of localities in which both pyrites and pyrrhotite occur. No detailed description of these deposits appear to be available. Dr. Matthew, reporting on the district in 1876, states that they may be of commercial importance in the future. A verbal communication to the writer by a resident of St. Stephen confirmed this view. Exploratory work is needed to determine if any of those deposits are of commercial importance.

When visiting some supposed occurrences of copper ores in New Brunswick, the writer was informed that a large deposit of pyrites was known to occur on the northwest Mirmichi river above Red Bank. Direct inquiries of the alleged owners have elicited the information that no such occurrence is known to them.

In conclusion, it may be said that geologically one would expect that pyrites deposits would occur in certain localities in these provinces, since the conditions are very similar to those which prevail in Newfoundland and in several of the States to the south and west where these ores are mined. Much of the country is very difficult to prospect on account of the cover of loose waste, and so little is known of the country that it should not be said that such deposits do not occur. The most that can be said is that at present no deposits have been discovered and sufficiently exploited to show that pyrites ore can be obtained on a commercial scale.

## PYRITES IN QUEBEC.

The pyrites deposits of the province of Quebec have been, until recently, the most important known to occur in Canada. Many of the ore bodies which have been mined for pyrites were discovered during the decade 1860-1870. The first claims were located as gold prospects: subsequently development showed that the ore contained an important amount of copper, and the claims were therefore operated as copper properties. A little later it was found that the high sulphur content of these ores rendered them valuable for acid making. The total output of the province during the last thirty-five years has probably exceeded one million tons of ore carrying 40 per cent. of sulphur or more.†

At the present time there are only two properties in active operation. These are the Eustis, formerly the Crown mine, located about 7 miles south of Sherbrooke, and the McDonald mine located about 7 miles from Weedon station on the Quebec Central Railway. The property adjacent to the Eustis mine, the Capelton mines of the Nichols Chemical Company, was operated between the years 1863-1908. In addition, a considerable amount of pyrites was mined at the Howard mine, formerly the Cillis, and at Moulton Hill northeast of Sherbrooke. Important deposits of pyrites are known to occur at the King mine, adjacent to the Howard, and on a property near lake Coulombre north of Garthby station on the Quebec Central Railway. Brief descriptions of these properties are given in subsequent paragraphs.

The occurrence of copper sulphides and of pyrite has been reported from a number of other localities in the province of Quebec. Where exploratory work has been undertaken it has almost invariably been for the purpose of discovering copper or gold ores. Occurrences of this type are particularly numerous in the belt of altered igneous rocks which runs in a southwesterly direction past the city of Sherbrooke. The district for about ten miles northeast of Sherbrooke and for about the same distance towards the southwest is worthy of very careful exploration, especially in the neighborhood of some of the old prospect openings. As the available information with respect to these prospects relates rather to their possibilities as sources of copper ore, detailed descriptions are reserved for the report on the Copper Resources of Canada.

Copper bearing pyrites minerals occur on almost every lot of the eighth and ninth ranges of the township of Ascot, south of Sherbrooke. A number of prospects also occur on the eleventh range and there are scattered prospects on other ranges.

Eustis mine.—This property is located on lots 2 and 3, Concession IX, township of Ascot, about seven miles south of the city of Sherbrooke. It is owned and operated by the Eustis Mining Co.‡

The discovery, which was made about 1865, was located on lot 4 of the ninth range. The ore body was followed down from the outcrop, and the main mass of ore was found to occur on the lot to the south. The ore body consisted of a series of sulphide lenses, dipping approximately at an angle of 35 deg. towards the southeast. The bottom of the present shaft is about 3,200 feet below the old sills. The largest of the lenses was nearly 800 ft. in length along the dip; the horizontal width, parallel to the strike of the rock structures, varies to about 250 feet, while the thickness varies from a few inches to over 70 feet at the widest points. The other lenses were of the same general shape, though somewhat smaller.

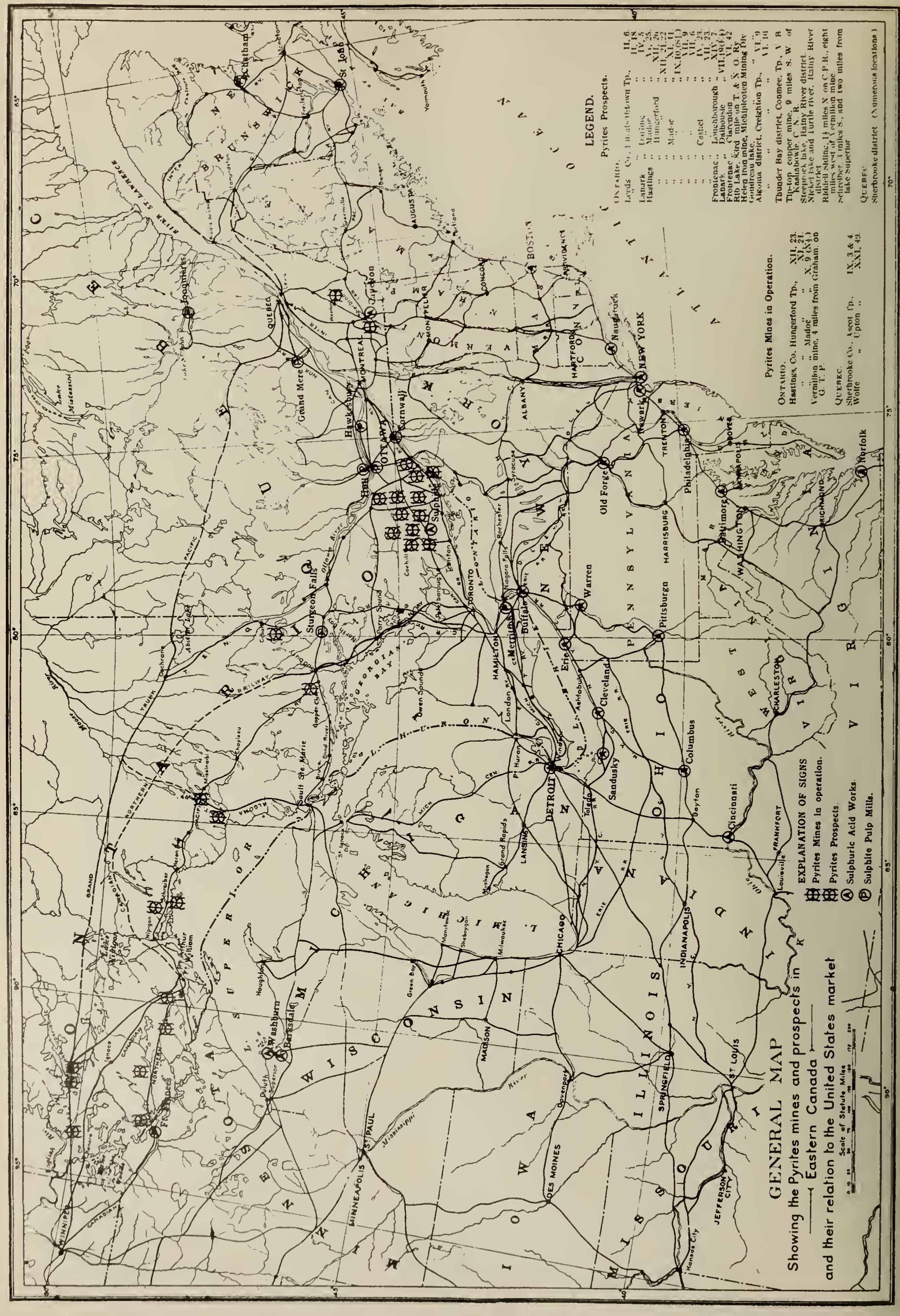
The total output of the mine, since it was opened, has probably been in excess of half a million tons of ore. At present, development work is well in advance of mining and there is said to be more than two years' supply ready for stoping. The ore is a particularly pure pyrites with which is associated chalcopyrite. The shipping ore contains 40-45 per cent. sulphur, some of the lump ore occasionally running as high as 50 per cent. sulphur. It usually contains less than 2 per cent. of copper, and very small values in gold and in silver. The ore from the upper portion of the mine is said to have contained a higher percentage of copper.

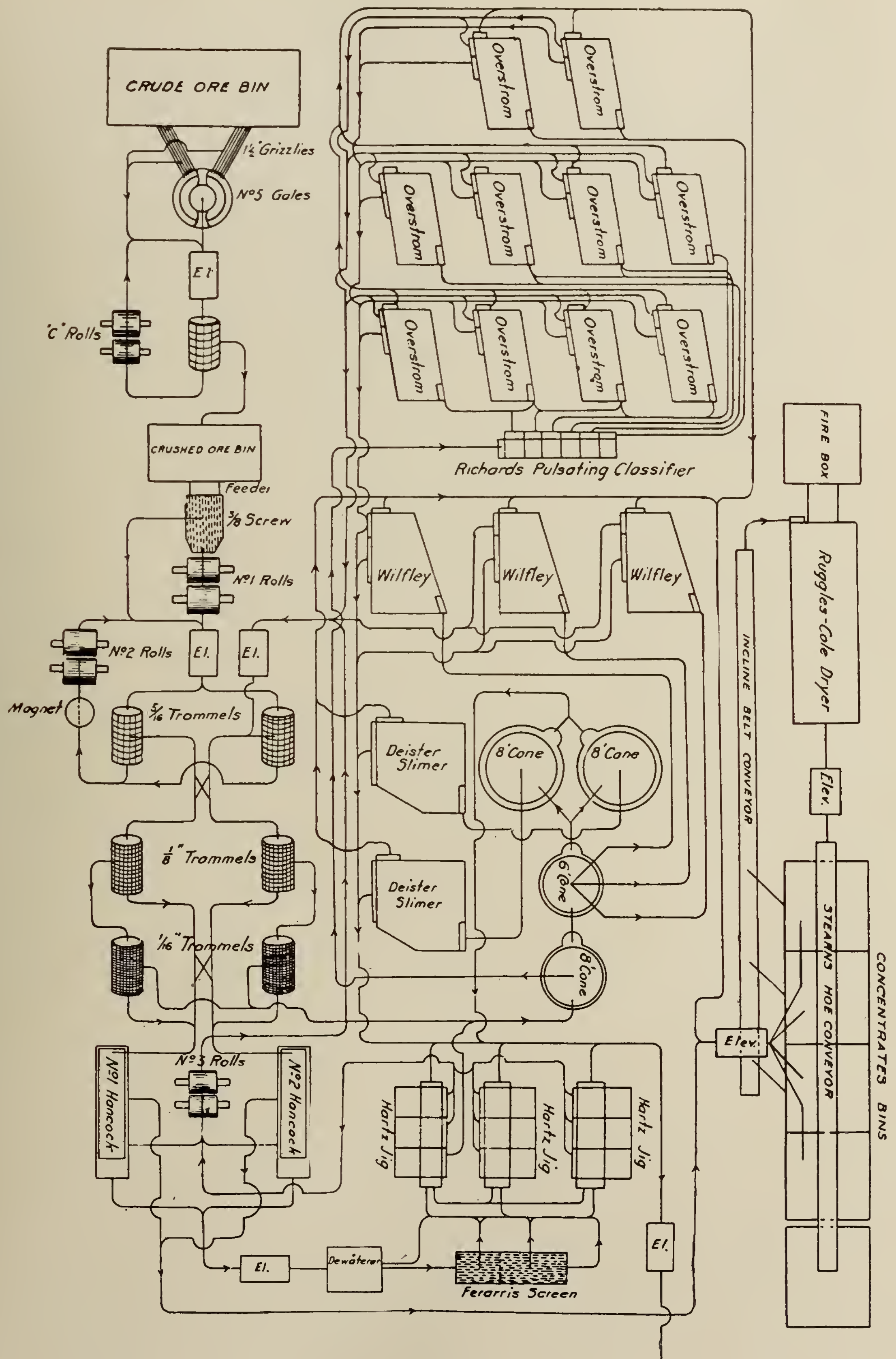
The ore is free from arsenic and is an excellent ore for acid making. It is said that ore from this mine was the first pyrites used in America for making sulphuric acid. It is also probable that it will be found very suitable for sulphite pulp manufacture.

The mine is operated by electric power generated on the Coaticook river. It is also provided with an auxiliary steam plant to operate the mill at times of low water.

There is a dressing mill on the property equipped to treat about one hundred tons of ore per day. The flow sheet of the mill is given on page 36 of this report.

*Dressing and Uses.—By Dr. A. W. G. Wilson, Mines Branch, Ottawa.
†No accurate statistics are available.
‡Head Office Brsoton, Mass., P.O. Box 1422.


GENERAL MAP
Showing the Pyrites mines and prospects in Eastern Canada
and their relation to the United States market
EXPLANATION OF SIGNS
Pyrites Mines in operation.
Pyrites Prospects.
Sulphuric Acid Works.
Sulphite Pulp Mills.
LEGEND.
Pyrites Prospects.
Thunder Bay district, Conmee, Tp.
Sherbrooke district (Numerous locations)
Pyrites Mines in Operation.
ONTARIO.
Hastings, Co. Hungerford Tp., XII. 23.
Vermilion mine, 4 miles from Graham on G. T. P.
QUEBEC.
Sherbrooke Co., Ascot Tp. IX. 3 & 4
Wolfe " Upton " XXI. 49.




Flow diagram, mill of St. Lawrence Pyrites Company

The dumps of waste which have accumulated during the earlier mining operations contain much good ore. They are now being sorted over and the concentrating ore is being sent to the mill for treatment.

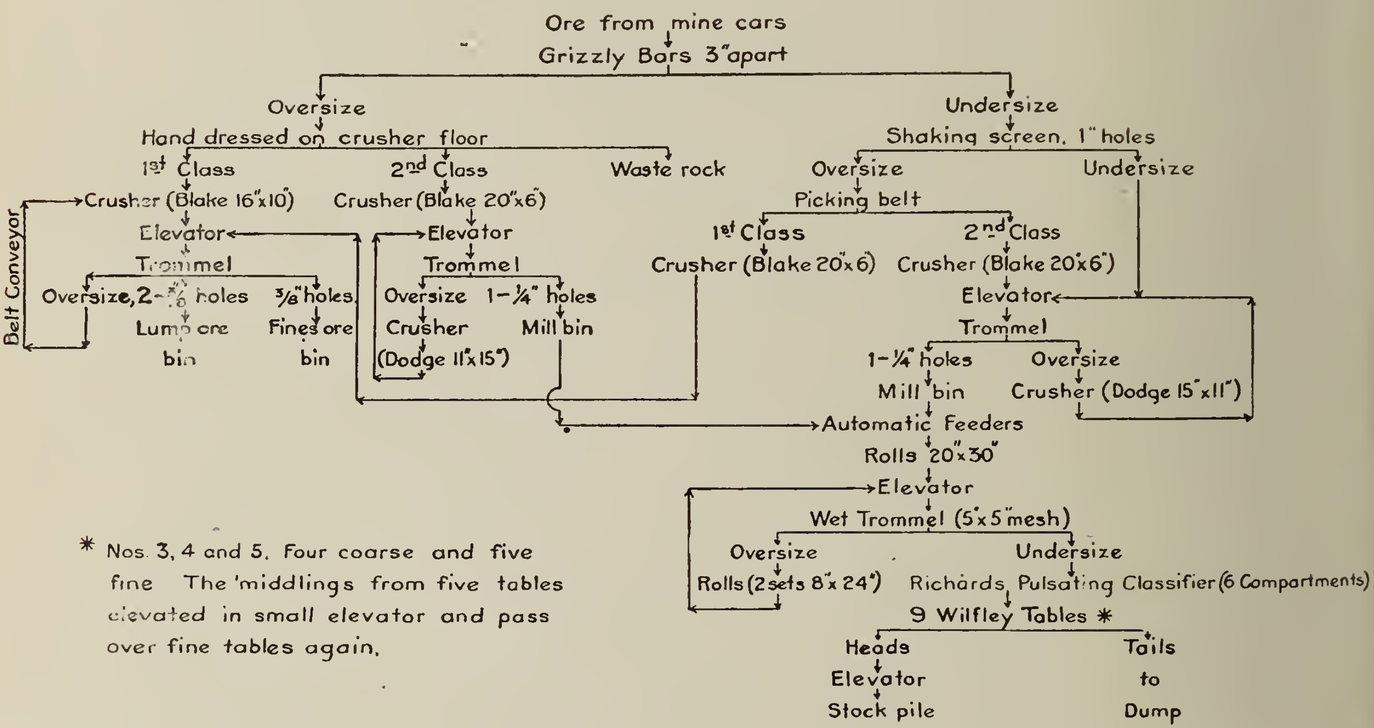
A small portion of the Eustis ore is utilized at the chemical works at Capelton. The greater part of the ore is shipped out of Canada to various chemical works in the United States. The copper and other values in the ore are recovered from the cinder at the smelter at Norfolk, Virginia, belonging to the principal owners of the Eustis company.

McDonald mine.—This property is located on lot 22, range I, township of Weedon, about 7 miles south and east of Weedon station on the Quebec Central Railway.

Exploration work was begun in the summer of 1909, by the sinking of small prospecting shafts. The preliminary work showed the existence of a promising body of ore, and more extensive operations were begun, including the sinking of what is now the number one shaft. During the last two years, development and exploration has been carried on systematically, and a considerable tonnage of ore carrying about 5 per cent. copper in addition to the sulphur has been shipped.

There are now two shafts on the property, number one, having a depth of 110 feet, and number two, which in January (1912) had a depth of 260 feet. The total amount of drifting, in January, 1912, was 900 feet, all

FLOW SHEET, MILL OF EUSTIS MINING COMPANY




had been done to block out ore in preparation for stoping. The development work is regarded as having proved the ore body to a depth of 300 feet, and for a distance along the strike of 530 feet. Development work is still being pressed forward, sinking at the rate of about 35 feet per month, and drifting at the rate of 100 feet per month.

The mine is now equipped with a boiler plant having a total capacity of 200 h.p. The air compressor plant is capable of supplying 600 cubic feet of free air per minute. In addition, each shaft is supplied with hoists, that at number two shaft having a capacity of 20 h.p.

An aerial tramway is now being installed to transport the ore from the mine to loading bins at the railway.

At present most of the ore is shipped to the works of the Nichols Chemical Company at Capelton. Smaller shipments have been made to United States points.
in ore. In addition a considerable amount of upraising

The property is operated by the East Canada Smelting Company, Limited.§

Capelton Mines.—The group of mines which may collectively be named the Capelton mines are located on lots 3 and 4, range VIII, township of Ascot. The original mines were Albert mine on lot 3, range VIII, and the Capel mine on the s.e. ¼ of lot 4, range VIII. With this group should also be included the old Crown mine on lot 4, range IX. As indicated in the reference to the Eustis mine, the ore bodies, first discovered on the Crown property, extend across the boundary towards the southeast, and it is on these ore bodies that the Eustis company is operating.

The first discoveries were made on the Capelton properties about 1863. They were first exploited as gold prospects, but development work soon demonstrated that there was a considerable quantity of cupiferous pyrite available. In the early days of their operation unsuccessful attempts were made to extract the copper by the Henderson process, and the mines were closed. Subsequently the properties passed into the control of G. H. Nichols & Co. This firm at first shipped most of the ore to sulphuric acid works near New York. Subsequently large acid works were established at Capelton, and later a small smelting plant, to treat the richer copper ores and cinder.

The mines were operated, practically continuously for about thirty years, and were finally closed in 1908, the deepest shaft having reach a depth of about 1,800 feet.

Several ore bodies occurred on the property on a strike approximately northeast, all having an inclination towards the southeast. The ore bodies varied in dimensions; in general the form appears to have been lenticular. The width of the several ore bodies varied considerably from narrow vein-like bodies to masses over 50 feet across. A considerable portion of the ore carried over 5 per cent. copper, and on one occasion an ore body of considerable size containing over 15 per cent. copper was encountered.

§President Chas. E. Force, 49 Wall St., N.Y.

The deposits on the Capelton properties are doubtless associated with big deposit of cupiferous pyrites on the Eustis property. They appear, however, to have carried more copper and to have been more irregular in their distribution.

The known ore bodies appear to have been exhausted and the mines were closed down in 1908. The closing of the mines is said to have been due chiefly to the difficulty of handling the water. Much of the plant has since been removed.

### PYRITES IN ONTARIO.

#### Brockville District.

Brockville Chemical Company.—In 1868, John Cowan and J. B. I. Robertson began mining for pyrite on lot 19, concession II, Elizabethtown township, Leeds county. The pyrite occurred in a series of lenses conformable to the lamination of a highly foliated pink granite gneiss. A series of irregular cavities and iron pyrites in parallel bands, and mining took the form of gouging out the richer shoots of ore, irrespective of any other consideration. No timbering was done, and when a part of the pit became unsafe, work at that point was abandoned. The main pit was sunk to a depth of 250 feet. The strike of the deposits was northeast, and the dip to the southeast. Mining operations ceased in 1879.

The ore from this property was used for making sulphuric acid in Brockville. After the mine was closed, pyrites was obtained from near DeKalb junction in New Hampshire. In a report of the Geological Survey of Canada,¶ the acid works are thus described:

"The Brockville Chemical Company's mine in the township of Elizabethtown has been closed since 1879. The chemical works are, however, still in operation. The pyrite at present used by the company is being brought from New Hampshire at the rate of a carload a day. There are 16 kilns in operation each having a capacity for 300 pounds of ore. The kilns are charged every hour and produce about 85 carboys of sulphuric acid a day. In the distillery there are 21 glass retorts attached to glass receivers for redistilling the crude acid. Besides the above, about 15 carboys of nitric and hydrochloric acid can be produced per day. In this case iron retorts and earthen receivers are used. The company employ 26 men."

A portion of the sulphuric acid was used at a fertilizer works in Brockville. Mixed acid was also supplied to two dynamite works in that neighborhood. One of these was started by C. W. Volney, the inventor of the Volney blasting powders, who afterwards sold out to one Griffin; and the other by Smith and Nelson, who were succeeded by Abbott and Harrison. Operations of all kinds ceased in 1880, and to-day not a vestige of these industries remains.

The cause of the decline and obliteration of these, at one time, flourishing industries was the prohibitive price of raw material. To the cost of mining near DeKalb Junction must be added hauling to the railroad and loading, freight to Ogdensburg, unloading re-loading on wagons and hauling three miles to the acid works. Working on imported ore, the plant could not successfully meet competitors. The evidence of men who worked in the old pits is to the effect that they were never completely exhausted.

McIlwraith Mine.—Lot 5, Concession IV, Darling township, Lanark county. The vein strikes slightly north of east along a contact between diorite on the south and crystalline limestone on the north. It was first opened up many years ago by W. H. Wylie, of Almonte, and Wm. Hall, of Darling, when prospecting for gold. They sank a shaft to a depth of 35 feet. The Nichols Chemical Company instituted mining operations under an option in September, 1899. The old shaft was deepened to 75 feet and from the bottom a drift run 8 feet to the east. A tunnel 150 feet long, with an outside approach of 50 feet was driven along the strike of the vein. This discloses a length of over 90 feet of workable ore, clean high grade pyrite enclosing lenses of quartz. A cross cut of 12 feet to the south failed to pierce the width of the deposit. The lens dips to the south at an angle of 60 deg., and pitches to the east away from the shaft which passed through it. It is claimed that it was caught again by the drift at a lower level. Work ceased at the expiration of the option, the end of April, 1900. Three carloads of ore were shipped. The mining was all done by hand. The gossan cap is 14 feet deep.

In a line of weakness caused by the contact of the diorite with the crystalline limestone, pyrite-bearing solutions have eaten out cavities and lenses in the limestone, depositing in them, pyrite and quartz. These break quite freely from each other, and the only impurity in the pyrite is small intermixed particles of quartz. Allowing for reasonable culling, an average sample from the tunnel, assayed by A. G. Burrows, yielded 42.6 per cent. sulphur, and a sample from a dump of 300 tons removed from the property to an adjoining lot, and which had been exposed to weather for six years, yielded 38.86 per cent. sulphur.

¶C. G. S., 1883, Part L, p. 10.

(To be continued.)

# SPECIAL CORRESPONDENCE

## NOVA SCOTIA

**Dominion Coal Outputs.**—The production from the Glace Bay mines in February was not so large as expected, owing to a severe snow-storm and "silver thaw" towards the end of the month. The sleet deposit was the worst for very many years, and completely demoralized all telephone and telegraph communication. About thirty thousand tons of possible output were lost through this storm. The actual outputs for February were, from the Glace Bay mines 336,919 tons and from the Springhill mines 32,155 tons. In March the Glace Bay production will probably be 370,000 tons and the Springhill production 36,000 tons. The net increase for all the Coal Company's mines in the first three months of 1913, as compared with the same period of 1912, will be about 118,000 tons.

Shipping was continued at Sydney until the 17th of February, and, if the drift-ice conditions are favourabel, should recommence towards the end of March. It is quite possible that shipping to St. Lawrence ports may commence about the fifteenth of April, as the ice in the river is not heavy this spring. Indications are that the Cape Breton collieries will ship an unusually large amount of coal to St. Lawrence ports during the coming summer.

Nothing in the progress of the mining industry in Cape Breton is more striking than the changed conditions regarding the working of the collieries in the winter months. The Dominion Coal Company's output for the first quarter of 1913 will be about 1,090,000 tons, which exceeds by 264,000 tons the entire output for the year 1893, the year in which the Coal Company was formed. In 1893 the output for the first quarter was 75,000 tons, whereas in 1913 a single week's production will reach 100,000 tons.

It is perhaps worth while to mention that in March 1913 the Dominion Coal Company will have been incorporated twenty years. In 1893 the output was 826,000 tons for the year. In 1912 the output was 4,513.269 tons, and No. 2 Colliery alone produced a tonnage equal to the entire output of the Company in the year of its incorporation. It is within the probabilities that the 1913 output will reach 4,900,000 tons, in which case the Company will, in twenty years, have increased its production six-fold. It can be safely stated that the Dominion Coal Company is the largest and most important single asset in Nova Scotia, and its prosperity and that of the Province are one and the same.

**Cape Breton Coal, Iron & Railway Company.**—It is understood that negotiations have been proceeding between this company and the Dominion Coal Company which may enable the Cape Breton Company to recommence operations. It may be remembered that this company opened and equipped a colliery at Broughton, but selected a site for the slopes which rendered it necessary to cross an area owned by the Dominion Coal Company before it was possible to win the main areas of the Cape Breton Company. In the past it was not found possible to come to an arrangement, but it is now probable that the Cape Breton Company will be able to obtain a lease from the Dominion Coal Company, which will enable them to proceed with the sinking of the deeps, and to mine coal. The deeps were sunk as far as the boundary of the Coal Company's property, but work was discontinued about 1907 owing to the impossibility of the deeps proceeding further without trespassing on the Coal Company's areas.

It is further stated that the Nova Scotia Steel & Coal Company may obtain permission from the Dominion Coal Company to mine coal from submarine areas off Sydney Mines belonging to the Dominion Company and adjoining the present undersea workings of the Scotia Company.

# ONTARIO

## COBALT, SOUTH LORRAIN, GOWGANDA AND ELK LAKE.

**Casey Cobalt.**—The Casey Cobalt Mining Company went on a regular production basis the week ending March 22nd. The weekly production will amount to 16,000 ounces, of which 6,000 ounces, or enough to make current expenses and leave a profit, will come from the mill as it is at present constitued. When it is treating 50 tons per day instead of its present 25 tons, this will of course be increased in proportion. The duplication of the mill should now not be a matter of any great length of time as all the machinery has been hauled over the clay roads and construction can go ahead rapidly.

As an example of success attained by perseverance under disappointment and difficulties the history of the Casey is illuminating. Situated eight miles out in the clay belt ,where no previous successes had blazed the way the company operated four years without making a cent of profit. The Casey had not the prestige that belongs to the Cobalt camp to help it and transportation difficulties consisting in the haulage over eight miles of bad roads to an island of conglomerate rock in a sea of clay was not calculated to inspire optimism. Patches of high grade ore were discovered and taken out, but nothing of importance was discovered until two years ago when the No. 6, or big vein of the mine, was cut.

It seems most probable that the conglomerate ridge on which the Casey is situated was at one time an island standing out above an arm of Lake Temiskaming. In the swamp below the mine a diamond drill was put down 210 feet before striking rock and close to the mine it had to be sunk over 90 feet before the bottom of the clay was found. The conglomerate ridge is about three miles running from the Casey Mountain where the granite contact occurs to the point where the rock disappears under the heavy overburden of clay. With the exception of three or four claims all this ridge is owned by the English syndicate which put the Casey Cobalt Mining Company on the market. They have 25 claims of 40 acres each, or a thousand acres, which, in the light of developments on the Casey, would all appear to be well worthy of prospecting. Much of this assessment work on these claims is now being done with the diamond drill, not to discover veins, but to establish depth of formation.

Unlike the Cobalt camp, payable ore is not mined from the grass roots down. The No. 1 or Robber vein, as it was called by the old management, was strong and well defined at the 30 and 100-foot level, but there was not more than eight or nine ounces of silver to the ton in the smaltite and niccolite.

The first ore body of any length and size struck on the Casey was the No. 6 at the 210-foot level. It was intersected in a cross cut 150 feet long from the old workings on No. 1 and it is significant that it does not show at all one the surface. It has now been developed for 350 feet, all of high grade, as it is reckoned high grade in Cobalt, that is about 2,500 ounces to the ton. The first car taken out of this vein gave returns to the company of $132,000 and this is the grade of ore right along the shoot. The vein is sometimes from six to nine inches of high grade ore and sometimes it is split up into four or five stringers. It has been drifted upon across the line on to the Kismet property, and here it is as strong as in any place in the whole of the workings. No ore has been shipped from the Kismet yet, though some has been stoped, but as two of the best veins have been definitely followed on to this claim south of the Casey it would appear to be a good prospect.

From the 210-foot level of the No. 6 vein a raise was put up 64 feet in good high grade ore all the way. At the top of this raise there was a patch of lean ore, but after drifting 25 feet to the south of the No. 2 raise, it came in well again and promises to develop finely on this level. Below the 210 or main level on the No. 6 vein another level has been opened up at the 260-foot and here again high grade has been encountered and a fair body of ore can be reckoned on in the reserves, but in drifting to the north the Keewatin contact is reached and as in Cobalt values disappear when the conglomerate is left. A small shoot of high grade ore was mined in the keewatin, but as a general rule the same conditions apply as on the West Ridge at Cobalt, where exploration in the keewatin under the conglomerate has not proven at all remunerative. The average depth of the conglomerate in the Casey is about 250 feet from the collar of the old shaft, but as it dips to the south it will probably be considerably deeper on the Kismet. As in Cobalt the highest grade ore in the widest ore bodies is found close to the keewatin—conglomerate contact.

The success which attended the opening up of the No. 6 vein led to the further exploration of No. 1, and it is now to be credited with a good body of ore. A cross cut was driven from the end of the old workings at the 100-foot level and at a distance of 200 feet a 60-foot shoot of high-grade ore was developed. On the same vein ore has also been found at the 160-foot level near the south boundary and in a winze put down 24 feet at a point 200 feet north from the shaft milling ore has been discovered so that there is every possibility of blocking out a good length of milling ore with some patches of high grade. The milling ore runs about 40 ounces to the ton. There are other veins, but they have not received much development to date.

The Casey Cobalt consists of 120 acres altogether, two claims together and one on Sutton Bay, near Lake Temiskaming. The eastern of these two claims has not been developed at all and on the one property not more than three acres have been touched. The Kismet claim is being developed from the Casey. A shaft has been sunk on the Townsite Extension and one or two veins cut. This is all the work going on at present, development in this isolated section being confined absolutely at the present time to the Casey Cobalt and associate interests.

The new shaft should soon be completed, when many of the difficulties that have hitherto attended the raising of ore will be removed. It has been found that it is cheaper to pay the settlers $2.50 a cord to cut wood than to haul coal from New Liskeard, and there are probably 5,000 cords in the yards now, but this summer arrangements will probably be made whereby the fuel bill will be cut down very materially.

During the year 1912 the McKinley-Darragh produced 2,717,383 ounces of silver worth $1,621,010. The total net profits on operations were $1,153,848. The total cost per ounce was 18.59 cents, leaving a profit of 43.07 cents per ounce. The ore reserves now developed show a total of 152,800 tons, estimated to contain 5,368,500 ounces of silver, 100,400 tons from the McKinley containing 4,133,500 ounces, and 52,400 estimated to contain 1,235,000 at the Savage. This compares with 5,561,780 ounces in 1912. While 2,717,383 ounces were produced during the year, the ore reserves were increased by almost 200,000 ounces. After paying $1,123,646 (including the first of January disbursement) there was a surplus of $422,326.

**Lawson Progress.**—The Lawson has discovered another good ore shoot on the No. 8 vein at the 115-foot level. In a raise 270 feet from the No. 8 shaft, a shoot of very spectacular ore has been discovered and has been developed for some distance. Th ore will run from 5,000 to 10,000 ounces to the ton.

**High Grade on Temiskaming.**—At the 575-foot level of the Temiskaming mine there has now been developed a shoot of high-grade ore from 65 to 70 feet long, with prospects of its continuing for some distance. The vein is from three to four inches wide, of 2,500 ounce ore, and there appears good prospect of making a tonnage of milling rock in the wall rock. This is the first ore body of any length and size the Temiskaming has been able to develop in the diabase below the keewatin.

### PORCUPINE AND SWASTIKA.

**McEaneny Mill.**—The five-stamp mill at the McEaneny is making $500 a day, or enough to pay all current expenses and leave a good profit. Another five stamps will be installed almost at once, as accommodation has been left for them in the present building. For the first half of the present month the heads to the mill ran $35 to the ton on an average. As this first instalment of the mill was designed more as a sampling plant than as a revenue producer, the results obtained are regarded as highly satisfactory. Regular clean ups are being made, bullion will be shipper every month, the first consignment going out at the beginning of the month.

Development continues to be most gratifying The ore shoot at the 200-foot level is now 600 feet long. The south face is now five to six feet of ore, assaying $40 to the ton. All the ore going through the mill is coming from development or the dump.

**Lucky Cross.**—At a distance of about twelve feet from the shaft a cross cut has penetrated the No. 16 vein of the Lucky Cross mine at Swastika, at the 200-foot level. The vein looks promising. Most of the machinery has arrived for the new mill and it is expected that it will be running by the first of April. The mill at the Swastika mine is already in operation. At Kirkland Lake there is much prospecting activity and a good many claims have changed hands.

There has been a fresh outbreak of lawlessness at Porcupine very largely owing to the withdrawal of provincial police from the camp. Non-union men going to and fro between the towns and their work have been waylaid and manhandled. These occurrences became so frequent that the non-union men at the mines united and proceeded to reprisals. At Timmins, Mayor Wilson read the Riot Act when he heard that a clash was likely between the non-union men and the union men and the situation looked dangerous. Fifteen provincial constables have been rushed back into the camp and they should be able to cope with the situation. There are over a thousand men now working at the various mines and not more than 200 strikers still remain in the camp.

**Jupiter At Work.**—The Jupiter has started work again under its new mine manager, Mr. Little, Mr. R. W. Brigstocke remaining as consulting engineer. The Porcupine Gold Mines is now ready to start work again on the Vipond and nearly every company that had any pressing need to resume at once is developing again.

## BRITISH COLUMBIA

Generally, mining continues to make good progress in various parts of the province, the chief exception being at the coal mines on Vancouver Island, of the Canadian Collieries (Dunsmuir) Limited. However, this company is succeeding in operating its Comox colliery, with mines about Cumberland, and getting out a considerable tonnage of coal, though not as much as before the miners went on strike. No coal mining is yet being done at the company's Extension colliery mines, efforts being concentrated in keeping open those first above-mentioned. In Kootenay district the only present evidence of labor difficulty is that given by a strike of miners at the Queen gold mine, Sheep Creek camp, Nelson mining division. If it be the intention of the Western Federation of Miners to call its members out of Slocan mines following the adverse majority report of the Board of Conciliation that investigated the conditions in connection with the demand of the Union for an increase of 50 cents a day in the men's wages, there is not yet any indication of such intention. It has been reported that both the Granby and Hedley mining companies have reduced wages 25 cents a day, in accordance with their announced intention of doing so under the sliding scale arrangement made when the price of copper went up. It is significant that the Britannia Company, which the Western Federation is fighting, is continuing to pay the higher rate which it voluntarily gave its men last September. If it be true that the Granby and Hedley companies have reduced the men's wages the position is that the Britannia Company is still paying the high price copper rate, notwithstanding that it is entitled to lower the rate to the old scale in force before the price of copper went up.

**Slocan and Rossland.**—These districts are associated in this notice for the reason that some information follows relative to the Le Roi No. 2, Ltd., and the Van-Roi Mining Co., the latter being an auxiliary company of the former.

The report of the Van-Roi Mining Co. for its last fiscal year shows that of 4,488 ft. of development work done, 3,470 feet was drifting and cross-cutting, and 1,018 ft. raising and sinking. The average cost of this work was $8.91 per foot. The quantity of ore concentrated was 54,115 tons, assay returns of which showed average valuable metal contents to have been 15.02 oz. silver per ton, 3.66 per cent. lead, and 6.26 per cent. zinc. The mill products were: Lead concentrate, 2,392.5 tons, containing 179.75 oz. silver per ton, 60.2 per cent. lead, and 11.1 per cent. zinc; and zinc concentrate, 2,570.5 tons, containing 60.8 oz. silver per ton, 3.7 per cent. lead, and 45.1 per cent. zinc. The total metal contents of the 4,963 tons of concentrates were: Silver, 556.363 oz.; lead, 3,070,640 lbs.; zinc, 2,848,860 lbs. In addition there was 712 oz. of silver, 1,860 lbs. of lead, and 3,000 lb. of zinc in six tons of ore shipped crude. The cost of mining the ore was $2.58 per ton, which was a little higher than that of the immediately preceding fiscal year. Cost of concentrating was 95 cents a ton. The Van-Roi mine and mill are situated within half a dozen miles of Silverton, Slocan Lake.

The annual report of Le Roi No. 2, Limited, owning the Josie, No. 1, and other properties in Rossland camp, shows that during the company's last fiscal year development work consisted of 5,817 feet of drifting and cross-cutting, and 298 feet of raising and sinking; total 6,115 feet. The quantity of ore mined was 40,112 tons, of which 18,257 tons was shipped crude to the Trail smeltery, and 17,116 tons was concentrated, the latter yielding 1,659 tons of concentrate. Assay returns showed that the ore shipped contained 0.7754 ounces gold and 0.6727 ounces silver per ton, and 1.39 per cent. copper. The concentrate contained 1.096 ounces gold and 0.643 ounces silver per ton, and 1.14 per cent. copper. Average value of the ore was $20.10 per ton, as compared with an average of $21.08 per ton for 27,098 tons shipped in the previous year. Concentrate averaged $25.75 per ton. Mining costs appear to have been $3.46 per ton, and smelting charges $5.77; while development charges and deduction for depreciation together come to $2.95 per ton; total per ton, $12.18, as compared with $11.41 for the preceding fiscal year. By arrangement with the Consolidated Company, boundaries between the respective properties of the two companies were adjusted, extra-lateral rights relinquished, and all claims for trespass, etc., waived.

At the meeting of the Le Roi No. 2, Limited, held in London during February, in the course of his address to shareholders, the chairman said: "One of the pleasantest features of the present Le Roi No. 2 position is the success which has attended the Van-Roi mine during the past year. That mine shows a net profit of £27,000 odd, and, though the last few months' workings have been disappointing, there is not the slightest doubt that this is only temporary, and due to causes easily explained, and that we may now safely regard the Van Roi as a profit-earner and a dividend-payer. It looks, indeed, as though the situation which was originally anticipated is about to be realized, namely, that when the Le Roi No. 2 production may be temporarily at a low ebb its receipts should be kept up by dividends from the Van-Roi mine. This is exactly what would have been the case at the present moment, had not the Van-Roi profits to go to pay off the capital debt which the mine had contracted."

**Coast District.**—The most important recent occurrences in connection with metalliferous mining in the Coast district have been those that resulted in the calling out, by the Western Federation of Miners, of between 600 and 700 men who had been employed by the Britannia Mining and Smelting Company, at its copper mines, concentrating mill, and auxiliary works, at and near Britannia Beach, Howe Sound. This action on the part of the miners' union had been threatened for some time, although it was hardly expected it would take place until several weeks later. The position was that last year a Board of Conciliation and Investigation having been held, a majority report recommended that the company withdraw its refusal to permit union officials to visit its mines to collect union dues, hold meetings, etc. The representative of the company on the board did not subscribe to the majority report, nor has the company since yielded on the point. The situation is an unusual one, for the company owns a large area of land surrounding its mines, together with the camp sites, all buildings, boarding and bunkhouses, landing dock, foreshore, etc. For some time it permitted union representatives to visit its camps, but eventually, concluding that (notwithstanding that there were not any complaints concerning working conditions, rates of wages, accommodation, etc.) this concession was being made use of to the detriment of its own interests, it forbade such visits and the holding of union meetings in any of its buildings. In support of its action it is claimed by its representatives that the company having done everything in reason for the comfort, and even for the recreation of its employees, it is well within its rights in the stand it has taken and is maintaining. In addition, it is urged that it has even gone farther than most other mining companies in expending money for the benefit of its employees, who, consequently, have no reasonable cause for complaint. It is a fact that for a long while those who financed the company found its operations a heavy drain at a time of monetary stress in the United States, where the chief owners reside. Well on for $1,500,000 was advanced to the company by Mr. Grant B. Schley, of New York, and his associates to carry out the work of development to explore the mine, and this was in addition to much money that earlier had been spent on similar work. The direct result of the enterprise of Mr. Schley and associates was that much ore of a payable grade was found, and production became important. In 1911, there was mined nearly 119,000 tons of ore, containing 46,000 ounces of silver and 8,685,000 pounds of copper; while in 1912 the output of ore was increased to 193,000 tons, containing between 70,000 and 80,000 ounces of silver and between 14,000,000 and 15,000,000 pounds of copper. For some time past 60 to 700 men have been employed by the company, and the daily outlay in wages and materials, including construction and substantial additions to plant and equipment, was approximately $6,000 a day. No other metalliferous mining enterprise on the British Columbia coast has in recent years approached this, neither in magnitude nor results. Yet the Western Federation of Miners says, in effect, we will not allow you to spend your own money in your own way, not if we can prevent it. However, the management of the company is not to be deterred from its course and at the time of writing it is operating its concentrating mill 20 hours a day, with two over-time shifts of 10 hours each, instead of the customary three 8-hour shifts, and is running its three-and-a-half mile aerial tramway from the mines down to the concentrator under similar conditions, and getting down practically three-quarters of the usual quantity of ore, while at the mine two shifts of men are delivering the ore to the tramway. Besides this, the work of driving the 5,000-foot cross-cut tunnel, the object of which is to open the mine at much greater depth and allow of delivery of ore to the tramway at a point half-way down the mountain, and so expedite transportation to the mill, has been resumed.

## COMPANY NOTES

### NOVA SCOTIA STEEL AND COAL

The annual meeting of the Nova Scotia Steel & Coal Company shareholders, held at New Glasgow on March 26th, was well attended. In every phase of the work carried on in the different plants in the past year, the efforts have shown substantial increases. An assurance that a good year was in store was announced by President Harris, who said that the total steel output for the first half of the year had already been contracted for at an improved price. The coal output would be larger and the prices maintained, while from the ore mines they anticipated a record yield at splendid prices. Of the new work outlined for the year, a new open-hearth furnace would be installed at Sydney Mines, a new colliery opened there, and some new equipment installed at Wabana. The retiring board was re-elected.

### ASBESTOS CORPORATION.

The Asbestos Corporation of Canada held its first annual meeting recently, when reports for the seven months ended December 31st were read by the president, Mr. W. G. Ross. The old board was re-elected for the ensuing year, as follows: W. G. Ross, president; H. E. Mitchell, vice-president; C. W. Colby, H. J. Fuller, Uzal H. McCarter, Thos. McDougall and William McMaster.

### HOLLINGER'S LATEST.

Profits of the Hollinger Gold Mines from January 1st to February 25th, according to the regular four weekly report being sent out to-day, with dividend cheques, were $241,600. This added to the surplus brought forward from 1912, makes $593,402, less two dividends of $180,000, leaving a surplus of February 25th of $412,-402. In the four weeks ended February 25th hte mill ran 91 per cent. of the possible running time, treating a total of 9,240 tons, or an average of 330 tons per day.

## STATISTICS AND RETURNS

### LA ROSE FOR FEBRUARY.

La Rose's February statement shows a total production for the month of 230,102 ounces of a value of $136,-182. This, with sundry income of $2,330 for the month, brought the total up to $138,512. With cost of marketing and other expenses deducted, a balance of $81,103 was left for the month. The financial position of the company, on February 28th, showed cash on hand of $1,425,886, outstanding shipments of $184,032, and $78,017 in ore ready for shipment.

### COBALT ORE SHIPMENTS.

Shipments for the week ending March 15th were almost double the amount of the previous week and the bullion shipments were also away above the average. Altogether thirteen mines were represented on the list, but only two sent out more than one car of ore. These two being the Dominion Reduction, shipping concentrates, and Kerr Lake sending out one car of high-grade and one car of low-grade. Drummond shipped concentrates, Bailey Cobalt high-grade, Right of Way low-grade, and Chambers-Ferland low-grade.

The shipments for the week in pounds are:

| Mine. | High | Low | Lbs. |
|---|---|---|---|
| Nipissing | .. | 1 | 106,840 |
| Beaver | 1 | .. | 43,000 |
| Dominion Reduction | 2 | .. | 127,300 |
| Peterson Lake | 1 | .. | 81,000 |
| Townsite | 1 | .. | 66,100 |
| La Rose | 1 | .. | 70,500 |
| Drummond | 1 | .. | 61,479 |
| Bailey Cobalt | 1 | .. | 41,830 |
| Right of Way | .. | 1 | 63,278 |
| Chambers-Ferland | .. | 1 | 64,000 |
| Cobalt Lake | 1 | .. | 64,482 |
| McKinley | 1 | .. | 58,309 |
| Kerr Lake | 1 | 1 | 121,290 |
| | 11 | 4 | 969,708 |

The bullion shipments for the week were:

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 85 | 103,152.80 | $61,108.03 |
| Buffalo | 60 | 66,918.00 | 34,000.00 |
| Crown Reserve | 38 | 43,000.00 | 26,000.00 |
| Colonial | 1 | 635.00 | 374.00 |
| Dominion Reduction | 34 | 38,474.40 | 23,084.64 |
| | 218 | 252,180.20 | $144,566.67 |

### BRITISH COLUMBIA ORE SHIPMENTS.

For the year to date the total ore production is 570,-008 tons. Smelter receipts for the week ended March 22nd were 47,725 tons and for the year to date, 491,678 tons. Ore output and smelter receipts in detail:

#### Boundary.

| | Week. | Year. |
|---|---|---|
| Nickle Plate, milled | 1,500 | 18,000 |
| Knob Hill | 28 | 819 |
| Ben Hur | 95 | 1,621 |
| United Copper | 63 | 1,179 |
| No. 7 | 62 | 562 |

| | | |
|---|---|---|
| Lone Pine | 133 | 274 |
| Granby | 27,255 | 264,568 |
| Mother Lode | 8,280 | 74,318 |
| Rawhide | 4,870 | 57,750 |
| Napoleon | 584 | 8,173 |
| Unnamed | 151 | 929 |
| Other mines | ... | 1,998 |
| Total | 43.021 | 430,191 |

### Rossland.

| | | |
|---|---|---|
| Le Roi No. 2, milled | 350 | 4,200 |
| Inland Empire, milled | 100 | 1,200 |
| Centre Star | 2,726 | 32,981 |
| Le Roi | 987 | 14,025 |
| Le Roi No. 2 | 489 | 5,279 |
| Other mines | ... | 160 |
| Total | 4,652 | 57,845 |

### Nelson.

| | | |
|---|---|---|
| Mother Lode, milled | 500 | 6,000 |
| Second Relief, milled | 200 | 2,400 |
| Queen Victoria | 531 | 6,789 |
| H. B. | 98 | 2,238 |
| Emerald | 77 | 553 |
| Other mines | ... | 7,580 |
| Total | 1,406 | 25,560 |

### Lardeau.

| | | |
|---|---|---|
| Other mines | ... | 137 |

### Slocan and Ainsworth.

| | | |
|---|---|---|
| Standard, milled | 500 | 6,000 |
| Van Roi, milled | 1,100 | 13,300 |
| Bluebell, milled | 1.200 | 14,400 |
| Kilo, milled | 100 | 1.200 |
| Rambler-Cariboo, milled | 300 | 3,600 |
| Standard | 363 | 3,653 |
| Bluebell | 89 | 2,205 |
| Eastmount | 31 | 90 |
| Rambler-Cariboo | 211 | 721 |
| Idaho-Alamo | 34 | 62 |
| Hope | 34 | 238 |
| Other mines | ... | 1,385 |
| Total | 3,862 | 46,854 |

### East Kootenay.

| | | |
|---|---|---|
| Sullivan | 534 | 8,353 |
| Other mines | ... | 363 |
| Total | 534 | 8.716 |

### Consolidated Co.'s Receipts.

Trail, B.C.

| | | |
|---|---|---|
| Knob Hill | 28 | 819 |
| Ben Hur | 95 | 1,621 |
| United Copper | 63 | 1,179 |
| No. 7 | 62 | 562 |
| Lone Pine | 133 | 274 |
| Standard | 363 | 3,653 |
| Bluebell | 89 | 2,205 |
| Eastmount | 31 | 90 |
| Rambler-Cariboo | 211 | 721 |
| Idaho-Alamo | 34 | 62 |
| Hope | 34 | 238 |
| Le Roi | 987 | 14,025 |
| Le Roi No. 2 | 489 | 5,279 |
| Centre Star | 2,726 | 32,981 |
| H. B. | 98 | 2,238 |
| Emerald | 77 | 553 |
| Sullivan | 534 | 8,353 |
| Other mines | ... | 4,299 |
| Total | 6,054 | 79,151 |

### B. C. Copper Co.'s Receipts.

Greenwood, B.C.

| | | |
|---|---|---|
| Mother Lode | 8,280 | 74.318 |
| Rawhide | 4,870 | 57,750 |
| Napoleon | 584 | 8,173 |
| Queen Victoria | 531 | 6,789 |
| Unnamed | 151 | 929 |
| Total | 14,416 | 147,959 |

### Granby Smelter Receipts.

Grand Forks, B.C.

| | | |
|---|---|---|
| Granby | 27,255 | 264.568 |

## SILVER PRICES.

| | New York. Cents. | London. Pence. |
|---|---|---|
| March 11 | 58⅜ | 65¼ |
| " 12 | 57⅞ | 64⅞ |
| " 13 | 57⅞ | 64¾ |
| " 14 | 56⅞ | 64⅝ |
| " 15 | 57½ | .. |
| " 17 | 57⅛ | 64⅜ |
| " 18 | 56⅞ | 64⅜ |
| " 19 | 56⅞ | 64⅛ |
| " 20 | 56⅞ | 26 3/16 |

## TORONTO MARKETS.

March 25.—(Quotations from Canada Metal Co., Toronto):
Spelter, 6.25 cents per pound.
Lead, 4.25 cents per pound.
Antimony, 10 cents per pound.
Tin, 50 cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 11 to 15 cents per pound.

March 25.—(Quotations from Drummond, McCall & Co., Toronto):
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.50 to $21.50 (f.o.b. Toronto).
Nidland No. 2, $20.50 to $21.50 (f.o.b. Toronto).

## GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼ inch lump.

### Coke.

March 20.—Connellsville coke (f.o.b. ovens):
Furnace coke, prompt, $2.45 to $2.50 per ton.
Foundry coke, prompt, $3.00 to $3.50 per ton.

March 20.—Tin, Straits, 46.25 cents.
Copper, Prime Lake, 14.85 to 14.95 cents.
Electrolytic copper, 14.80 to 14.90 cents.
Copper wire, 16.00 to 16.25 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 6.15 to 6.25 cents.
Sheet zinc (f.o.b. smelter), 8.25 cents.
Antimony, Cookson's, 9.00 cents.
Aluminium, 26.50 to 27.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $2.00 to $2.25 per lb.
Quicksilver, $39.00 per 75-lb. flask.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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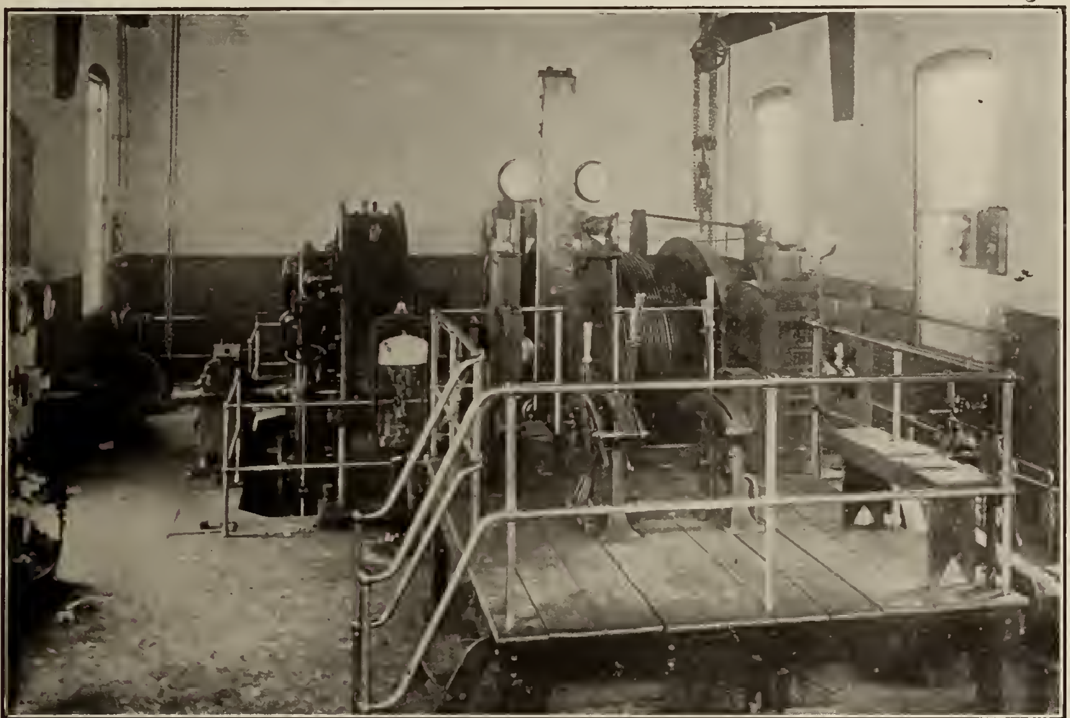

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Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co, Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers. Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Go.

**Rock Drill—**
Cleveland Pneumatic Tool Co. of Canada Ltd.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co. Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co. Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonsan Iron Works, Ltd.

**Excavators.**
Jeffrey Mrg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

**Girders—Steel—**
Dominion Bridge Co.

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

**Injectors—**
Mussens, Limited.
Peacock Bros.

**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersol-Rand Co., Ltd.

**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.

**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.

**Lights—Mine Bldg—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Link Belt—**
Watrous Engine Works.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Nickel—**
Can. Copper Co.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.

**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.

**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

**Pneumatic Tools.**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Electric—**
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Pneumatic—**
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
E. Leonard & Sons.

**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersol-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

**Pumps—Turbine—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

**Pumps—Vacuum—**
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Rolling Mill Machinery—**
Peacock Brothers.

**Rolls—Crushing—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.
Allis-Chalmers-Bullock.

**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Separators—Magnetic—**
American Grondal Co.
Wetherill Magnetic Separating Co.

**Shovels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

**Smelting Machinery—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
Consolidated Mining & Smelting Co.

**Stamp Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Canadian Ingersol-Rand Co., Ltd.
Peacock Bros.

**Steel—Manganese—Castings—**
Peacock Bros.
Hadfield's Steel Foundry Co.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
N. S. Steel & Coal Co.

**Steel—Structural—**
Dominion Bridge Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.
John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Transformers—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

**Tube Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Turbines—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Robb Engineering Co., Ltd.

**Water Wheels—**
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

**Wheels—**
Mussens, Limited.
Jeffrey Mfg. Co.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.

**Wire Cloth—**
Mussens, Limited.
B. Greening Wire Co.

**Wire (Bare and Insulated,**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

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OL. 34 TORONTO No. 8



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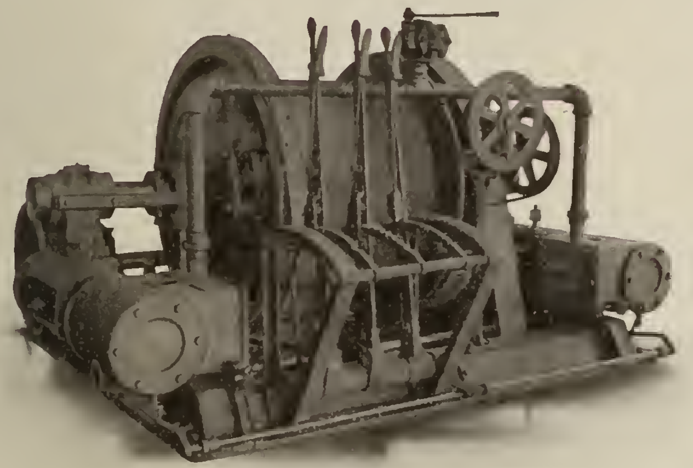

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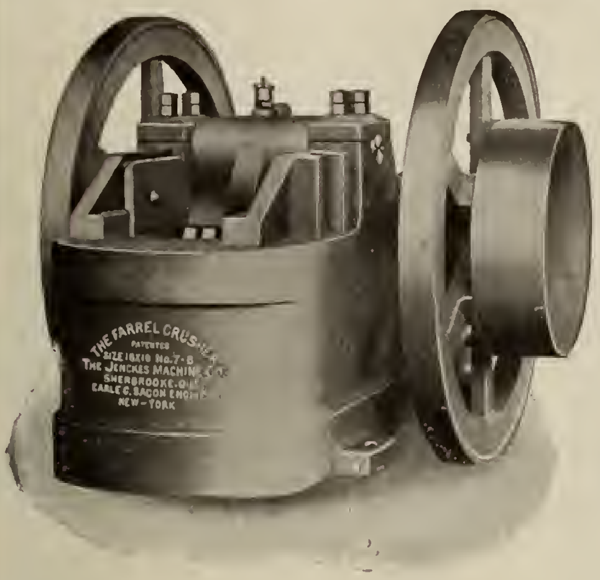

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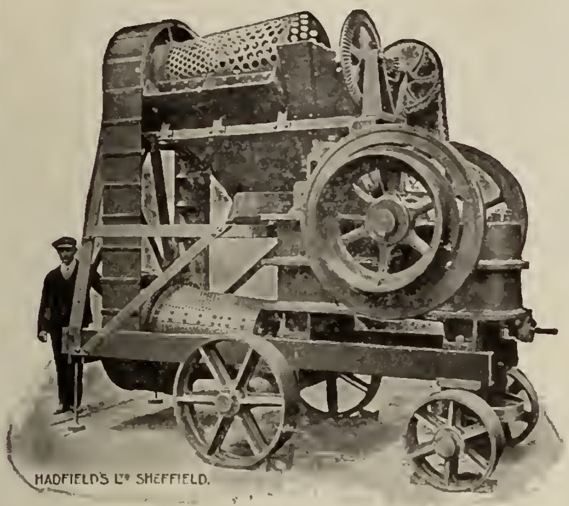


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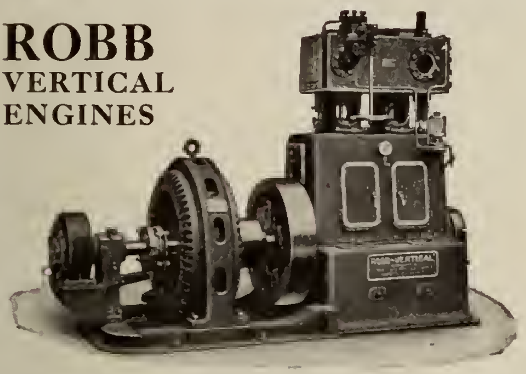

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39-43

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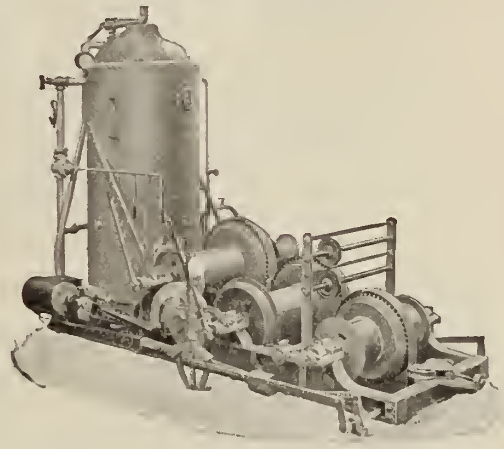

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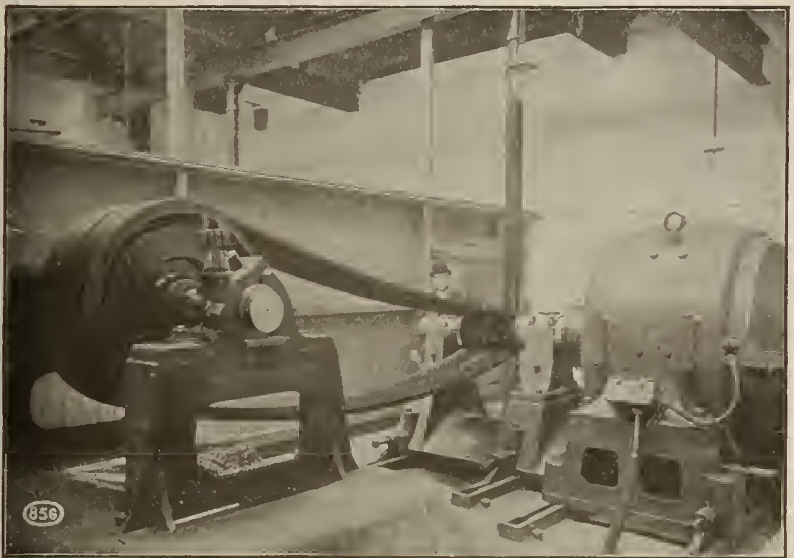


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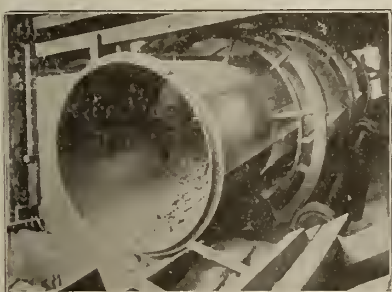

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, April 1,5 1913. No. 8

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CONTENTS.



## THE LEGAL STATUS OF THE UNITED MINE WORKERS OF AMERICA

When the United Mine Workers of America, some five or six years ago, were carrying on the campaign of disruption that ended in the disastrous strikes of 1909 at various Nova Scotian coal mines, the coal operators were greatly laughed at because they stated their belief that the activities of the U. M. W. A. were not entirely unconnected with the desires of the American coal operators to control the markets where Nova Scotian coal came into sharp competition with coal from the United States. Later developments proved that the suspicions of the Nova Scotian coal owners were very well founded, and an interesting sidelight on the local situation is given by an important judicial decision recently handed down in est Virginia in connection with an injunction against the U. M. W. A. asked for by the Hitchman Coal & Coke Co., of Wheeling, West Virginia.

In 1909, Judge Dayton, of the District Court for the Northern District of West Virginia, granted a preliminary injunction against the U. M. W. A. restraining them from picketing the mines of the Hitchman Coal Co. After legal proceedings extending over the whole of the intervening period, Judge Dayton, in December, 1912, confirmed the injunction and made it perpetual. The reasons actuating the decision are so apposite to the conditions that existed in Nova Scotia previous to the strikes of 1909 as to be well worth quoting. Judge Dayton sums up as follows:

"I conclude, therefore, that this organization, known as the United Mine Workers of America, is an unlawful one, because in its constitutions, obligations for memberships, and rules which (1) requires its members to surrender their individual freedom of action, (2) seeks to require, in practical effect, all mine workers to become members of it whether desirous of doing so or not, (3) seeks to control, and restrict, if not to destroy, the right of the mine owner to contract with its employees independent of the organization, (4) to exclude his right to employ non-union labour if he desires, (5) to limit his right to discharge, in the absence of contract, whom he pleases, when he pleases, and for any cause or reason which to him seems proper, (6) assumes the right on its part, by and through its officers, to control the mine owners business by shutting down his mine, calling out his men on indefinite strike in obedience to their obligation to the union, whether the men desire to quit work or not, whenever the union's officers deem it for the best interest of the union, regardless of the rights and interests of the mine owner, and regardless of his direct loss and damages and such indirect loss and damages as may be incurred by him by reason of the resulted violation of contracts by him with others.

"I further conclude that it is an unlawful organization because of its procedure and practices in that (1) it seeks to create a monopoly of mine labour such as to enable it, as an organization, to control the coal-mining business of the country, and (2) has by express contract joined in a combination and a conspiracy with a body of rival operators, resident in other states, to control, restrain, and to a certain extent destroy the coal trade of the State of West Virginia. It has spent fourteen years of time and hundreds of thousands of dollars to accomplish this unlawful purpose. The rules of law relating to the responsibility of individual members concerned in such a combination are plain and well defined."

The coal operators who are joined with the U. M. W. A. in this injunction are the unionized operators of Western Pennsylvania, Indiana, Ohio, and Illinois, known as the "contracting" States. The leaders of the U. M. W. A. have undertaken, at the request of the coal operators of these four States, to unionize West Virginia, hence the strikes at Cabin and Paint Creek that have been distinguished by the anarchy which seems to be inseparable from the methods of the U. M. W. A.

From a strategical point of view, it was no doubt very good business on the part of the U. M. W. A. leaders and the Pennsylvania operators to attempt to absorb and control the mine workers of Nova Scotia. Had these gentlemen succeeded it is beyond doubt that last year, instead of the Nova Scotian coal mines producing their record output, and thereby netting to the Provincial treasury the largest sum for royalties yet collected, they would have become caught in the maelstrom of American labour politics, and would have been laid idle by the leaders of the U. M. W. A. in "sympathy" with the strikers in Illinois and other places in the States. From their actions in the past it is evident that the thoughtful miners of Nova Scotia do not intend to sacrifice themselves to the inordinate ambition of the labour oligarchy in the United States, particularly when it is seen that the effects of the U. M. W. A. strikes smooth the path of the sales agent of the United States coal operator.

## THE EIGHT HOUR ACT

The Ontario Legislature has this month passed an Act that specifically limits the time per day that any workman can spend underground. The text of the Act will be found in another column. It is brief, concise, and comprehensive. Despite the warm protests of mine managers it was most expeditiously passed through the House.

The Hon. Mr. Hearst, Minister of Mines, is the putative father of the Act. It is fitting that this should be so. It is not fitting, however, for any Minister to tamper wih a principle in the manner that Mr. Hearst has. Clause 5 of the Act is specious, so specious as to rouse immediate criticism. By this clause the Lieutenant-Governor in Council is empowered, upon the recommendation of the Minister, to suspend the operation of the Act in so far as any iron mine is concerned. Except for the general provision that "in the event of great emergency or grave economic disturbance," no other class of mine is granted immunity.

Not for a moment would we impugn the Hon. Mr. Hearst's motives. Seeing, however, that he represents an iron-mining constituency, we feel it but fair to remark that had he known the needs and disabilities of other branches of mining in Ontario as well as he knows those of iron-mining, he would never have consented to the present form of the Act.

We have pointed out several times that the miner, of all industrial employees, is probably the best paid, the most comfortably housed, and the most fairly treated. It is, therefore, not seemly that the industry of mining should be experimented upon. There are grave abuses in many trades that cry for remedy. Why not have dealt with these first?

## THE CANADIAN MINING AND EXPLORATION COMPANY

The first annual report of the Canadian Mining and Exploration Company, Limited, covers the last eight months of the year 1912. During that period no less than 428 projects were submitted to the company, and considered by its officers. None was accepted. "Only a few," says Mr. Ambrose Monell, the president of the company, "proved sufficiently attractive to warrant "thorough examination and report. Some of these pro-"perties were promising mines and prospects, but the "terms under which there are at present available give "inadequate opportunities for profitable business."

Of the total, 285 projects were of Canadian origin, 110 came from the United States, 21 from Mexico, and the remainder from Central and South Americas, the Malay States, and South Africa.

Mr. Monell does not consider this discouraging. He alludes to the fact that very much valuable information has been gained, information that will be of inestimable value in the future.

Our readers will recall that the Canadian Mining and Exploration Company is an international organization with headquarters in New York and a central Canadian office in Toronto. The shareholders include many of the most prominent Canadian and United States financiers. The capitalization of the company is $5,000,000, of which $2,500,000 has been subscribed. This sum is so invested as to bring the company an annual income of about $125,000. Thus ample provision is made for the employment of a large staff of engineers.

Although many interests are represented in the company, the prime object of its existence is to develop Canadian mines. It is, therefore, a trifle surprising that not one of the many mines and prospects considered has been purchased. This cannot be due entirely to the character of the properties themselves. Nor can it be attributed justly to uniformly prohibitory prices asked by the owners. To a large extent, the refusal of 285 Canadian mining properties must be set down to a policy of extreme caution on the part of the company. No doubt during the future this praiseworthy deliberateness, we shall not call it timidty, will be modified.

# THE HOLLINGER REPORT

In the forefront of the revival of gold mining in Canada stands the Hollinger mine. The shares of Hollinger Gold Mines, Limited, are the thermometer of the mining share market. The mine itself is the centre of interest in Porcupine.

While this condition is essentially due to the character and extent of the Hollinger ore bodies, it has also been brought about by the sane attitude of the management. The public has been kept thoroughly in touch with development, and results have been regularly announced. In brief, the management has confidence in the mine, and the public has confidence in the management.

The second annual report of the company has just come to hand. It contains much interesting matter and thoroughly deserves comment. Part of the report is reprinted in this issue of the *Canadian Mining Journal.* Here we shall touch upon only the salient features.

Up to the end of 1912 the Hollinger mine paid three dividends, each of $90,000. The total profits were $600,664.42. Of this sum $101,801.69 was carried forward as a balance, $106,223.54 was written off the plant, and $102,639.19 was written off development. The average value of all the ore treated was $21.44. The tonnage put through the mill amounted to 45,195 tons, having a gross value of $970,304.89. The total recovery was $933,681.53. Mining costs were high, $3.588 per ton. Milling costs averaged $1.693 per ton of ore treated. The total cost per ton was $6.744, of which $0.508 per ton was charged to expenditure incidental to the strike. Both milling and mining costs were abnormal, and both will be lower during the present year.

The ore reserves are estimated at $644,540 tons containing gold valued at $11,271,400, an average of about $17 per ton. This compares favourably with the estimate of one year ago when the value of reserves was placed at $10,230,000.

Our readers will draw their own conclusions from the Robbins report as reprinted in this issue. No doubt it will strike most of them that it is merely a matter of time when the tenor of Hollinger ore will necessarily be somewhat reduced, and, as a natural consequence, the plant will be enlarged. But be this as it may, the fact obtrudes itself that the Hollinger mine is in a strong and healthy condition.

# EDITORIAL NOTES

At the recent annual meeting of the Canadian Mining Institute, Mr. Henry Bertling, of Toronto, gave a demonstration of the Pulmoter, a device for producing artificial respiration by delivering oxygen automatically to persons rendered unconscious by gas poisoning, drowning, or electric shock. The value of this apparatus in connection with mine rescue work is unquestionable, and in recognition of its utility in this respect the device was recently awarded, by the Jury of Awards of the American Museum of Safety, the Scientific American Gold Medal, which is presented annually "for some three years, and exhibited in the Museum's collections."

From an authoritative source, we are given to understand that while the London money market is for the time being disinclined to consider proposals for the financing of Canadian industrial undertakings, however sound, there is a revival of interest in Canadian mining for which it is not difficult to secure capital. This is no doubt due to the successful results attending the operation of one or two mines in the Cobalt district and elsewhere in which British capital is invested, and also to the rehabilitation of the mining industry of Canada in general. Unfortunately advantage has already been taken of this favourable disposition by a class of mine-peddlers and promoters whose activities in the past are largely to blame for the non-success of the majority of the British-owned mining enterprises in the Dominion, and a number of very dubious "propositions" are now being offered in London. If the British capitalist would take the very obvious precaution of securing the advice of responsible engineers resident in this country before taking any final steps, the percentage of failures to successes would be very considerably reduced.

The proposal for a union of the Mining and Metallurgical Society of America and the American Institute of Mining Engineers, has been already endorsed by the Council of the former organization, and the question will be determined finally this month by letter ballot of the members. In effect, the plan as outlined is the same as that projected some few years ago in Canada, when it was suggested that there should be an association of mining engineers, distinct from the Canadian Mining Institute, but affiliated with it and requiring that membership in the Institute should constitute an essential qualification for registration in the former. In some respects it is unfortunate that this project was allowed to drop. In the United States the Mining and Metallurgical Society has served a useful purpose, which as a "section" of the American Institute it will be able to continue without restriction. The same opportunity presents itself in Canada.

In a recent bulletin issued by the United States Bureau of Mines, some astonishing figures were presented showing the enormous waste in connection with the production of coal in that country. Thus it is stated that in 1912, in producing 500,000,000 tons of coal there was wasted or left underground in such condition that it probably will not be recovered in the future 250,000,000 tons; while there was turned into the atmosphere a quantity of natural gas larger than the total output of artificial gas during the same period in all the towns and cities of the United States. If this was the case in the United States, it is safe to assume that conditions in Canada would prove to be worse. In the Province of by men without capital to develop their properties pro- Alberta especially, where many small mines are "worked" perly, and who are only concerned in making a few dollars quickly without regard for the future, the waste is appalling; and it is high time for legislative interference to prevent it.

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Legislation in a right direction has been enacted recently in Montana for the regulation of the sale of mining securities in that State. Under the new law every company offering stock or securities for sale is obliged to file with the authorities an itemized statement showing the actual financial condition, the nature and extent of its properties, copies of all contracts, literature and advertising matter, and other particularized information. The State appoints a commissioner who is given authority to investigate the affairs of any company, and no dividends may be paid without his approval. With these restrictions "wild-catting" in Montana, provided, of course, the law is effectively administered, should not prove a too easy undertaking.

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Two of the bright spots in the mining firmament of Eastern Ontario are the Cordova gold mine and the Belmont iron mine. At the former about 100 tons of gold ore are being treated per day. At the latter, preparations are practically completed for the shipment of substantial quantities of iron ore. At both mines exceedingly cheap power is being used, and both seem to have overcome the disabilities under which they formerly laboured.

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## PERSONAL AND GENERAL

Mr. L. K. Armstrong, of Spokane, Washington, editor of the Northwest Mining News and secretary of the Spokane Local Section of the American Mining Institute, has been in correspondence with the secretary of the Western Branch of the Canadian Mining Institute, relative to the joint meeting of the two organizations it is intended to hold at Rossland, B.C., on May 22 and 23.

Mr. W. M. Brewer has returned to Victoria, B.C., after an absence of eight months, spent in Alaska, where, in the vicinity of Valdez, he has been prospecting a gold mining property and installing a small stamp mill.

Dr. A. E. Barlow will probably again visit Western Canada during the ensuing summer.

Mr. D. C. Botting, of Seattle, Washington, State Inspector of Coal Mines, though unable himself to attend the meeting of the Western Branch of the Canadian Mining Institute, held at Nanaimo last month, was instrumental in inducing Mr. J. F. Menzies, of Rosyln, Wash., to go in his stead and read a paper there.

Mr. Wm. Blakemore, of Victoria, B.C., editor of "The Week," now includes in that weekly publication a mining column, which is edited by himself.

Mr. L. A. Campbell, of Rossland, B.C., general manager of the West Kootenay Power and Light Co., who represents the Rossland constituency in the British Columbia Legislative Assembly and is chairman of the Mining Committee of that body, was last month entertained at a complimentary smoker at Rossland on his return to that city after the close of the recent session.

Mr. F. Napier Denison, of the Dominion Meteorological Office, Victoria, B.C., has accepted an invitation extended to him by Prof. Andrew C. Lawson, professor of geology and mineralogy at the University of California, to deliver two addresses—one technical and the other popular—before the annual meeting of the constituted societies of the Pacific Association of Scientific Societies, in connection with the special research seismological work he has for some time been engaged in. Mr. Denison, who went West from Toronto, has on three occasions addressed meetings of the Western Branch of the Canadian Mining Institute on the subject of "Earthquakes, Strains and Stresses, in Relation to Coal Mine Disasters."

Mr. W. E. Finch, of Spokane, Washington, manager for a syndicate that is developing several mines in Slocan district, British Columbia, under option of purchase, lately spent several days in Victoria.

Mr. Francis Glover, formerly employed at the Extension colliery of the Canadian Collieries (Dunsmuir), Limited, Vancouver Island, B.C., has been appointed superintendent for the Princeton Coal and Land Co., operating a coal mine at Princeton, Similkameen, in succession to Mr. James Holden, resigned.

Prof. J. C. Gwillim, of the School of Mining, Kingston, expects to spend next summer in Alberta, on some of the coal lands of the Canadian Pacific Railway Department of Natural Resources.

Mr. W. S. Haskins, who some years ago was connected with mines in Rossland, B.C., has latterly been engaged in developing mineral calims in the Hazelton part of Skeena River district, British Columbia.

Prof. Arthur Lakes, of Denver, Colorado, a well-known contributor to various mining journals, is now resident in the vicinity of Ymir, Briitish Columba, with his son, who is manager of the Wilcox gold mine in Ymir camp.

Major Ainsley Megraw, of Hedley, Similkameen, B.C. (an old Ontario man), editor of the Hedley Gazette, has done good service to the mining industry of Hedley camp by exposing the discreditable career of one C. H. Brooks, who had commenced a campaign of unscrupulous advertising in the City of Vancouver with the manifest intention of obtaining money from the public, professedly for the development of a mining property near Hedley. Mr. Brooks has since left British Columbia.

Sir Richard McBride, Premier and Minister of Mines of British Columbia, on the occasion of his responding to an invitation to deliver a Charter Day address at the University of California, received the honourary degree of Doctor of Laws.

Mr. F. M. Sylvester, of Spokane, Washington, assistant to the general manager of the Granby Consolidated M. S. and P. Co., lately spent a week or two in the British Columbia coast cities of Victoria and Vancouver.

# TENTH INTERNATIONAL GEOLOGICAL CONGRESS MEXICO, 1906.*

By WILLET G. MILLER.

The Tenth International Geological Congress is not wholly unknown even to people in this country who take little or no interest in geology or mining.

The audience may recall the attention which the Canadian newspapers gave to certain features of the Mexican Congress. One morning, for instance, it was announced with startling headlines that a distinguished congressionist from Montreal had been overwhelmed by a volcanic outburst on Mount Colima. Another day telegraphic despatches told in no less terror-inspiring language of a snowslide on Mount Orizaba that carried with it a Toronto congressionist three thousand feet to the depths below. Happily these despatches, copies of which with brief, but appreciative obituary notices I found in my scrapbook the other day, proved to be but fabrications of press agents, and all the members of the Canadian contingent returned to their native land, a little the worse for wear, perhaps, but still in a satisfactory state of convalescence.

In describing the Mexican Congress it will be well to note briefly various features of the work of organization, the excursions, the sessions, entertainments and finally the achievements or beneficial and lasting results of the congress. A knowledge of these features should be of value in making arrangements for the Canadian Congress, and in carrying out the work. Incidentally I shall refer to the natural attractions that Mexico had in 1906 for entertaining a large body of people. If it is decided that our country, compared with Mexico, is lacking in natural attractions or in facilities for entertaining, then we should attempt to make up for these in other ways. Personally I believe that Canada, while offering a great contrast to Mexico, will prove no less attractive to our visitors, and that the achievement of the Twelfth Congress will be of much importance to science and to their country.

The following passage from Prescott, describing the march of Cortez' conquering army nearly 400 years ago, from the sea to the valley of Mexico, shows the character of the scenery:

"Nothing could be more grand than the view which met the eye from the area on the truncated summit of the pyramid. Toward the north stretched that bold barrier of porphyritic rock which nature has reared round the Valley of Mexico with the huge Popocatepetl and Iztaccihuatl standing like two colossal sentinels to guard the entrance to the enchanted region. Far away to the south was seen the conical head of Orizaba soaring high into the clouds, and nearer the barren, though beautifully shaped Sierra de Malinche, throwing its broad shadows over the plains of Tlascala. Three of these are volcanoes, higher than the highest mountain peak in Europe, and shrouded in snows that never melt under the fierce sun of the tropics. At the foot of the spectator lay the sacred city of Cholula, with its bright towers and pinnacles sparkling in the sun, reposing amidst gardens and verdant groves, which then thickly studded the cultivated environs of the capital. Such was the magnificent prospect which met the gaze of the conquerors, and may still, with slight change, meet that of the modern traveller as from the platform of the great pyramid his eye wanders over the fairest portion of the beautiful plateau of Puebla."

For some years many geologists had expressed the hope that a meeting of the Congress would be held in Mexico at a time convenient for the government of the country and the Mexican geologists. The publications of the Geological Institute of Mexico had shown that the country offered a vast field for geological studies of all kinds. Moreover, being such a beautiful land and so interesting from other points of view, its natural features having been so well described by Humbolt and its early history in the fascinating pages of Prescott, and possessing great mineral wealth and historic mines, offers unexcelled attractions to visitors, especially to those from more northern regions.

At the Ninth Congress, held in Vienna in 1903, the hope of having a meeting in Mexico was realized, it being decided to hold the tenth meeting in that delightful country. Canada had also sent an invitation to Vienna, but the attractions of Mexico and the hearty invitation extended by the Government and the Geological Institute won the day for the southern country.

The invitation having been definitely accepted, a Committee of Organization was formed. This committee solicited the co-operation of all geologists residing in Mexico, and of a certain number of mining and other industrial companies and finally that of the governors and high officials of various states of the Republic whose assistance would be valuable in the conduct of the excursions.

The Executive Committee was composed for the most part of members of the National Geological Institute (or Geological Survey), the president being the director of the Institute. The committee was charged with all the preparations for the Congress, both of a scientific and of a purely administrative character.

The organization committee had over ninety members among whom were the foreign directors of several companies, e.g., Sir Weetman D. Pearson and Mr. John Hayes Hammond. The executive committee consisted of twelve members.

Local committees were organized in various states of the Republic to assist with the work of the Congress and to arrange for receptions and other entertainments. In most cases, during the excursions the Governors of the states acted as chief hosts.

### Financial Assistance.

In addition to other assistance, the Mexican Government made a grant of \$164,000, or \$82,000 in gold, for the expenses of organization, the arranging of excursions, the publishing of the guide book and for other purposes.

All the railways in Mexico gave important reductions, at least fifty per cent., in the price of transportation. Half fare rates from all points east of Buffalo, Pittsburg and Atlanta to Mexico and return were

*An abstract of this paper was read at the meeting of the Organization Committee of the 12th Congress in Ottawa in March. About six-sevenths of the time devoted to the 12th Congress will be occupied with excursions, which will be of as much interest and value to mining engineers or to geologists, hence the Congress might properly be called a "Mining and Geological Congress."

given by the United States railways. The railways controlled by the Pearsons and by the Copper Queen and other companies, not only gave free transportation but they made the excursionists their guests in all respects.

The Copper Queen Company, and other companies, whose hospitality the writer had the good fortune to receive, sent a splendidly equipped train to El Paso to meet the excursionists at the border. For six days the excursionists were the guests of these companies, visiting the smelters at Douglas and the mines of Bisbee, Cananea and Nacozari.

### Steamboat Fares.

European members were encouraged to visit Mexico by the government paying for a reduction of one-half of the steamboat fares on specified lines, viz., Hamburg-American and Ward, either to Vera Cruz or to New York.

The "Compana Translantica Espanola" gave a reduction of thirty-three per cent., and the Mexican Government made the reduction up to fifty per cent. by paying the difference.

The Mexican Government also assisted transportation during the excursions by furnishing saddle horses from detachments of the rural police. Horses were always available when needed. (I am sure it would be most interesting to this audience were one of the Canadian excursionists to relate his experience in riding one of these metalled rurale chargers from the railway station at San Juan to the Pyramids of the Sun and Moon, through roadways lined with stone walls and giant cacti, across the parched Aztec plain even to the slopes of the pyramids themselves. Compared with his ride, that of John Gilpin was merely a canter in a village street, and Mazeppa's steed, so well described by Byron, was not more wild and free. In his account of the excursion, however, President Aguilera speaks of it as forming a "joyous caravan," some on foot, others in carriages, but the greater number "à cheval.")

### Excursions.

Preceding and following the sessions which were held in the City of Mexico from Sept. 6th to the 14th, several excursions were given under the patronage of the government. The earlier excursions consisted of one to the south lasting nine days, one to the east, three days, one to Jourallo, thirteen days, and one to San Andres and Colima, twelve days.

After the sessions there was an excursion limited to 250 persons to the north, through the great mining regions, that lasted twenty days. The excursionists occupied two trains, each person being given a section to himself. Connected with this excursion was the complimentary one to mining and smelting centres given by the Copper Queen and other companies in Arizona and Sonora.

After the excursion to the north there was another, essentially for paleontologists, beginning October 6th and lasting eight days, to the southern part of the Republic.

During the sessions four extremely interesting excursions lasting not longer than a day each were given. They were held on alternate days so as not to interfere with the sessions.

One of them was to Coyoacan to see the great lava flows, which, while recent in a geological sense, are prehistoric. Human remains, fragments of pottery, cobs of Indian corn and other materials show that the flow took place after the area was occupied by man.

The second excursion, to the historic City of Cueruavaca, was organized by the Geological Society of Mexico, and the excursionists were welcomed by the Governor of the State of Morelos and a reception committee. The park, the botanic garden, and especially the palace of Cortez, which still stands little impaired by time, are all of historic interest. At the banquet, given on this as on all other excursions, one of our Mexican hosts cheered us with the words: "Ladies and gentlemen, I drink to the glory of your countries; friends of Mexico I drink to your health."

The Minister of Public Instruction "desiring to show his profound regard for the congressionists" organized the third excursion, to visit the Pyramids of the Sun and Moon. The excursion was under the direction of the Inspector of Archeological Monuments. The pyramids proved to be most interesting, resembling those of Egypt, and the banquet of the afternoon in the grotto or huge cave was in all respects unique. It is much larger than the historic one described by Virgil, in which Dido and Aeneas sought refuge from the elements. In fact the Porfirio Diaz cave is large enough to have accommodated the entire retinue of these famed personages, so that one pair need not have been left in lonely isolation.

In his memoirs, my friend Aguilera has not tarried long in describing this cave banquet, but we recall that the Director of Public Works received us with the words, "Mexico welcomes all who have good will in their hearts and science in their brains."

The fourth of these excursions was made to the famous silver mines of Pachuca where a welcome was extended and a banquet provided by the Governor and other high officials of the State of Hidalgo and of the City of Pachuca.

### Sessions.

The opening session was held at 11 o'clock on the morning of September 6th, in the great reception hall of the National School of Engineers, under the presidency of his Excellency, the President of the Republic, General of Division Don Porfirio Diaz, high protector of the Congress. There were also present the Diplomatic Corps and the Ministers of State.

I shall not say much concerning the sessions, except that like the excursions, receptions and entertainments they were a credit to the Mexican geologists, who had devoted much care and attention to securing papers on important subjects and arranging for discussions on leading themes. Most of us do not attend geological congresses in order merely to listen to the reading of papers and to discussions. While at such a gathering these are valuable and necessary, persons visiting a country as attractive as Mexico desire to learn something of its geology at first hand, and to become acquainted with fellow students of geology from other parts of the world.

Four major subjects were selected by the executive committee for discussion, and the promises of several men to lead in each subject were secured some months before the sessions began. The subjects were: Conditions of Climate in Geological Epochs, Relations Between Tectonics and Igneous Masses, Genesis of Metalliferous Deposits, and Classification and Nomenclature of Rocks. Papers were read and discussions took place on various other subjects during the session.

### Receptions and Entertainments.

While these have been referred to incidentally in preceding notes it will be well to mention them more systematically in order to show what may be expected of us in Canada during the coming summer. In many ways Mexico possesses, or did possess in 1906, facilities for entertaining a larger body of people than can be equalled in but few countries. We in Canada cannot hope, I fear, to make the social side of the Twelfth Congress so enjoyable and attractive as was that of the Tenth. However, Canada's newness, a country in the making, will appeal to many.

On the evening of the 5th of September, preceding the opening session, there was a reunion of the congressionists at the restaurant in the historic wood of Chaupultepec. As Aquilera says, "the time was spent in a manner very animated," and there was a dinner with music by the artillery band.

On the evening of the following day, the members of the Geological Institute held a reception. The interior of the hall was decorated with the flags of all the nations represented at the Congress. There was band music and a "champagne supper." Three hundred persons were in attendance.

The morning of the 7th was spent in visiting public institutions of the city, carriages being furnished. Visits were made to the National Museum, the National Medical Institute, National Library, the Cathedral, and the Academy of Fine Arts. Small parties visited the National Astronomical Observatory.

In the evening of this day the Government Council of the Federal District, and the Municipal Council tendered a banquet at the Municipal Palace. Flags of various nations were again in evidence here. Those in attendance at his banquet included representatives of the Diplomatic Corps and members of the Mexican Government. At the head table presided the Vice-President of the Republic. The souvenir of the banquet took the form of a beautifully illustrated volume descriptive of the city.

A concert, with "champagne lunch" was given on the evening of Sept. 8th. On the evening of the 10th a reception was held by one of the members of the government.

President and Madame Diaz on the evening of the 12th, offered a "tea" in the beautiful chateau de Chaupultepec. The cards of invitation announced a "five o'clock tea," but in reality the presidential residence had been prepared for a soiree concert. Arriving at the chateau at five o'clock the congressionists were received by President and Madame Diaz. At this reception were the members of the Diplomatic Corps and high officials of the government.

From the high balcony of the chateau a magnificent view could be had of the distant volcanoes, Popocatepetl and Ixtaccihuatl.

At six o'clock commenced a concert in which the principal Mexican artists took part. At seven dinner was served, and at 11.30 the guests departed having been delightfully entertained for over six hours.

On the evening of the 14th a "banquet fraternal" was held.

The entertainments provided at various places during the excursion were numerous and showed the interest that the Mexican people as a whole took in the congress.

### Achievements of the Congress.

Of great importance and variety were the achievements of the Mexican Congress.

For instance, in referring to the Geological Guide Book, prepared under the direction of the Executive Committee, a United States technical journal, Economic Geology, said:

"Mexico has during the last decade become the seat of such expensive mining operations that even the most meagre geological information is eagerly welcomed by all geologists and mining engineers, and a publication so thoroughly and carefully prepared as this geological guide must be at once recognized as having an unusual scientific and practical value. Beautifully illustrated, it gives sections and maps of all important mining districts and noteworthy geological features of the various regions covered by the excursions of the Congress. Certain of the papers on economic geology furnish the only available information on more than one district of widely recognized commercial importance.

"Mexico is to be congratulated on having placed in the hands of professional men information so long desired on mining districts whose remote and unknown geological character has in no small measure handicapped successful mining in the regions concerned."

Of the geological map of North America, prepared in co-operation by the United States, Mexico and Canada, the same journal said:

"The second publication which accompanied the guide is scarcely of less importance and value to students of geology. Nothing so comprehensive has every appeared in the way of geological maps."

(While our guide books and maps cannot be said to deal with areas wholly undescribed, still they put the descriptions in handy form, and give a good synopsis of the literature. Will not our publications be as valuable to Canada as were those of the Tenth Congress to Mexico in making known the country's mineral resources and geology?)

The excursions were not less valuable than the publications. They gave members of the Congress exceptional opportunities for becoming acquainted with many of the large and historic mines, the geology, archaeology and numerous other features of great interest in the Republic. (Certain of the congressionists, at least, have shown their interest in the natural resources by making investments in the country and have induced others to do so.)

The published discussions on various geological themes during the sessions have a lasting value.

Not the least of the important results of the Congress was the kindly feeling engendered in the hearts of the visitors towards Mexico and her hospitable people. During the last month it was with feelings of sadness that we read of the partial destructions of that city which Diaz attempted to make, and in many respects succeeded in making, the most beautiful in North America.

We must all admire the achievements of President Diaz, one of the greatest military statesmen of his own or of any age. Weighted with years he had at last to retire. May another leader arise to bring peace and continued prosperity to the great, the beautiful, and the historic country!

# THE OCCURRENCE OF PYRITES IN CANADA

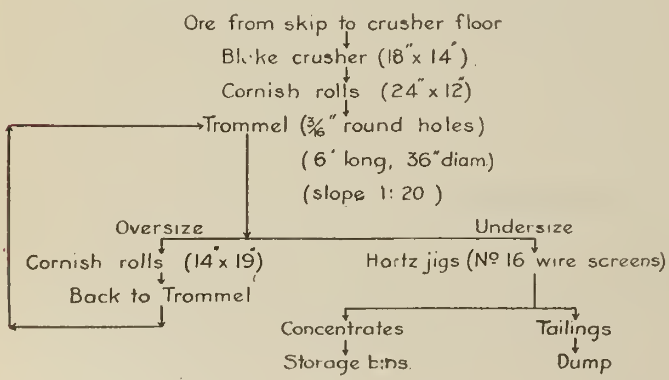
Notes from the Report* of Dr. Alfred W. G. Wilson.

(Continued from last issue.)

### Hastings District.

Bannockburn Pyrite Mine.—Lot 25, Concession VI., Madoc Township, Hastings County, about a mile southeast of the Village of Bannockburn. 1898, openings were made for iron ore, and Stephen Wellington, of Madoc, shipped eleven carloads of bog iron ore or limonite to the Hamilton Iron and Steel Company. This ore, which ran upwards of 38 per cent. metallic iron and low in sulphur, was merely the gossan capping of iron pyrites deposits. These were further prospected by Thomas Burnside and William Coe of Cleveland. In the summer of 1900, they transferred their lease to the American Madoc Mining Company, who abandoned operations at the McIlwraith in favour of the more accessible deposit. The gossan capping at the Bannockburn mine varied in depth from 8 to 15 feet. A pit about 80 feet in diameter and 90 feet deep was sunk, but at this stage had to be abandoned. Through the oxidation of low grade ore, large masses began to scale off the sides of the pit, necessitating either an expensive system of square set timbering or cessation of the work. In the meantime a new lens had been opened up about 500 feet south of the open pit. A shaft was sunk here, levels run every 60 feet, overhaul stoping adopted, and a skipway with guard rail provided. A battery of boilers and a five-drill, straight-line air compressor were installed, which supplied the drills, steam being used for the pumps. In later years this method of working was abandoned for the following practice. A pit or trench 8 or 10 feet in depth was sunk and this

FLOW SHEET, MILL OF COLE MINE, ST. LAWRENCE CO., N.Y.




was followed by underhand stoping back the full length of the lens. For convenience in mucking, the skip was replaced by a bucket; the lens pitched to the north and was penetrated by the shaft so that the operation of the skip had become impossible. The skids at the top of the rock house were inclined to the horizontal. As the loaded bucket was hoisted into this position, a chain was hooked into a ring in its bottom, the skids were pulled apart, and the bucket was dumped by lowering it slightly. The bucket was then hoisted, the chain unhooked, and it was then thrown back on the skids and lowered. The bucket loads were dumped on steel bars, placed 6 inches apart above a series of grizzlies spaced to one-half inch. The fines from the grizzlies discharged through the rock house floor and the culled lump ore was wheeled out to a loading dock, whence wagons drew it half a mile to the siding of the Central Ontario Railway.

Some shipments from the open pit graded from 46 to 48 per cent. of sulphur, and some from the south lens did not run higher than 37 per cent. A fair average of the property would be 40 per cent. of sulphur. The ore is hard and makes very little fines.

The country rock is a chlorite schist, showing talcose or micaceous alteration in the vicinity of the ore bodies. The south lens and enclosing schist strike slightly west of north until west of the open pit, when a fold of 90 degrees angle turns the strike to a little north of east. The south lens dips with the country rock to the east, and the open pit in a similar manner dips to the south. Unfortunately the surface of the schist at the apex of the fold was covered by a deposit of limestone, which was subsequently metamorphosed to a calc schist, but there is no evidence whatsoever of faulting. Folding, whether of a simple nature or a pitched anticlinal subsequently eroded, produced the lines of weakness through which the pyrite-bearing solutions seeped, the deposits being formed by replacement. The ore separates readily from the fairly good foot wall, but towards the hanging, the grade lowers, and it shades gradually into the schist. It is impossible to obtain fresh specimens of the schist. Originally it was probably horn-blendic; at present it is chloritic, due probably to surface weathering and the influence of the mineral bearing solutions from the adjacent vein. The south lens is 160 feet in length, and varies from 8 feet to 15 feet in width. The mine employed from 35 to 40 men and shipped during its six years of operation about 580 tons per month. All the ore went to the works of the General Chemical Company at Buffalo.

Although the ore fell off neither in grade nor quantity with depth, yet on account of the open pit method of mining (the south lens being stoped out to a depth of 275 feet), and the tendency of the walls to scale, mining became so hazardous that the operations were abandoned in August, 1906.

The Hungerford Fahlband.—The Hungerford fahlband lies about 5 miles east of the Village of Tweed north of the Canadian Pacific Railway. It strikes north 65 degrees east, and is easily traceable for two miles. Level farm land to the south is underlain by garnetiferous crystalline schist cut by massive diorite. About 500 yards north of the deposits, the schists have been invaded by a pink hornblende granite that now rises above the surrounding country, forming a series of rugged hills (locally called the Bald Mountains); this granite has protected the ore bodies from erosion. The deposits are strung along the contact of the diorite and the schist, the strike of the lenses, the contact, the fahlband, and the schists being identical.

Hungerford Mine.—Lot 23, Concession XII., Hungerford Township, Hastings County. This mine was opened 30 years ago, by the American Madoc Mining Company, as a gold property, and a smelter was erected to extract gold from the barren pyrite. The present operators, the Nichols Chemical Company, re-opened the mine in June, 1903. Owing to some difficulty about the title, the mine was closed down in August, 1904, but operations were resumed in August, 1905, and have since been continuous.

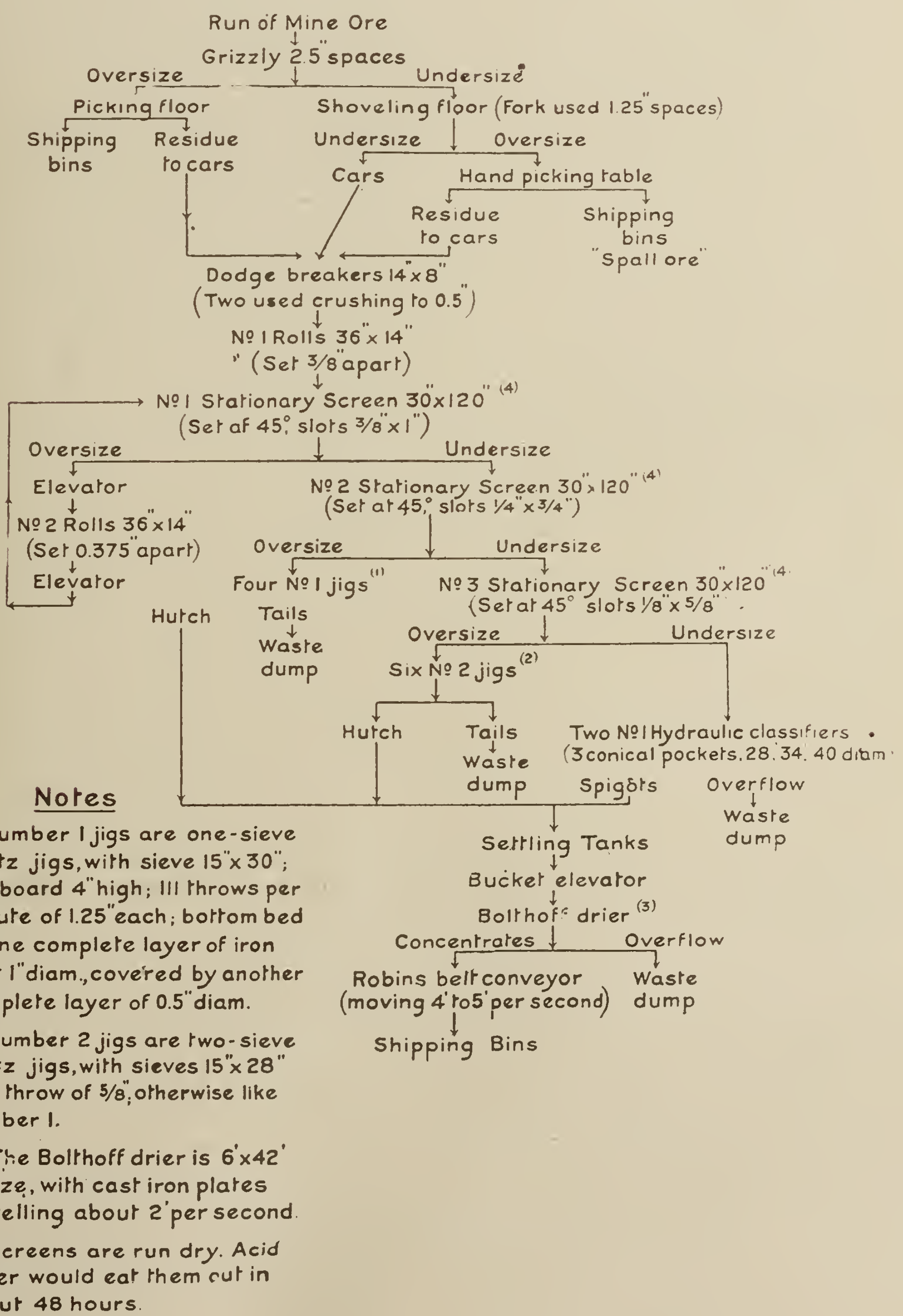
*Dressing and Uses.—By Dr. A. W. G. Wilson, Mines Branch, Ottawa.

The first shaft was sunk in the diorite footwall to a depth of 300 feet, and levels were run every 100 feet. Two other ore bodies were discovered, one from surface outcrops, the other during the progress of underground work. On each level cross cuts were made to catch these ore bodies, known respectively as the middle and north lodes. There are now two shafts on the property, and about 3,500 feet of drifting has been done on the ore bodies on five levels, exclusive of cross cuts, and the sixth level is now being opened up.

In exploitation work winzes are usually carried down in advance of shaft sinking. At present the main shaft is being sunk from the 5th to the 6th level.

The middle lode has no visible outcrop on the surface. It lies 85 feet to the north of the south lode, and was found when drifting towards the north lode on the first level. Cross cuts have also been run through this lode on the 2nd and 3rd levels, and considerable exploratory work has been done upon it. It carries ore on the 1st and 3rd levels, but not on the 2nd. This lode, on

FLOW SHEET, SULPHUR MINES AND RAILROAD COMPANY,
SULPHUR MINES, VIRGINIA.



the first level, has a width of about 6 feet of high-grade ore, but on the 2nd level it contains a very large quantity of calcite.

The north lode lies 45 feet farther north. When first cut, it was 22 feet wide, 17 feet being through massive pyrite. The length of this lode, as indicated on the surface, is over 500 feet. On the 3rd level, drifts have been run along the lode 370 feet east and 250 feet west of the cross cut that runs to the south lode. The width varies between 6 and 22 feet.

The mine is fairly dry, very little water being encountered, and that chiefly on the north lode.

Much of the ore that has been hoisted has been secured during development work. Some stoping has also been done on the three upper levels. At present the bulk of the ore hoisted is obtained during the development work.

The ore is coarsely granular and makes a large percentage of fines. The main impurity of calcite, though there is also some quartz present. A small quantity of pyrrhotite occasionally occurs, mainly in the north lode next the footwall.

. . . . . . . .

At the present time only fines burners are used at the works. Hence no lump ore is required. In preparing the ore for the Herreshoff burners, the lump and spalls are passed through a No. 3 McCully crusher (capacity about 150 tons per day) and a set of Buchanan rolls, 24 inches by 14 inches. The lump and spalls are dry enough to be used at once. The fines from the mine are dried in a wood fired rotary dryer before being fed to the furnaces.

In shaft sinking, two machines are used, in drifting only one—both Ingersoll and Holman drills are in use. For stoping both Rand and Hartzog hammer drills are employed.

Overhand stoping is employed throughout the mine. The main drifts are run the length of the ore body. Chutes are placed about 20 feet apart, and an 8-foot ore pillar is left above the drift. The stopes are raised to within 8 feet of the level above, just enough ore being drawn off during stoping to give working room above the broken ore in the stope.

The drifts are 5 feet wide and 6 feet 6 inches high. Both the ore and rock break hard, and usually 19 or 20 holes are required to square a cut. Most of the drifting is done on contact.

Power is obtained from the Seymour Power and Electric Company, the generating station being at Campbellford, 40 miles away. The current is received at a voltage of 44,000, and is stepped down to 240 volts for use in the plant and mine.

All the ore mined is used directly in the acid works which has been erected on the property at Sulphide station by the Nichols Chemical Company. The average percentage of run of mine ore will be about 35 per cent., the fines being much higher.

The Canadian Pacific Railway main line between Montreal and Toronto crosses the southern end of the property, a little more than a quarter of a mile from the mine.

Ontario Sulphur Mines, Limited.||—The property of this company comprises the northwest quarter and the east half of lot 21, concession XI, township of Hungerford, Hastings county, having a superficial area of 150 acres. Work on the property commenced in March, 1908, and has been carried on continuously, save for a shut-down of two months in the summer of 1910. The pyrites deposit on which work has been done is located about half a mile east of the Hungerford mine. It appears to be a lens pitching towards the southeast.

The main shaft (14 by 7 feet) has been sunk to the 100-foot level. Below this it was narrowed to 10 by 7 feet and was carried down to 250 feet below the collar. On the 100-foot level drifts have been carried 84 feet west and 98 feet east along the lode. On the 200-foot level the west drift runs 17 feet and the east drift has been carried 170 feet from the shaft.** A cross cut has been run for 30 feet from the east drift on the 100-foot level; for 12 feet from the west drift on the 200-foot level; and for 27 feet from the east drift on the 200-foot level.

The work which is being carried an at present is largely for exploration and development.

The present plant consists of two upright boilers with a capacity of about 65 horsepower. The mine is provided with one 3-drill Clayton air compressor operating two Corkill and three hammer drills. The hoist is capable of hoisting 1,200 pounds 300 feet. The pumping equipment consists of a duplex steam pump for the boilers and one Cameron sinking pump.

It is proposed to install electric power by extending the power line of the Seymour Power Company from the plant of the Nichols Chemical Company less than three-quarters of a mile to the east. The shaft is to be straightened and a skip track installed. The new equipment will include a 2-ton electric hoist, and a 12-drill air compressor. A shaft house will be erected with ore sorting floor and bins. An aerial tramway will be run to the Canadian Pacific Railway where it crosses the company's lot about 1,800 feet from the mine and unloading bins will be provided at the siding.

The company are also considering the erection of a concentrating plant, but this will not be erected this year.††

The total shipments from the property up to the first of May, 1911, have been 4,821 long tons of ore averaging 36½ per cent. sulphur.

The Queensboro Fahlband.—This fahlband, which is near the eastern boundary of Madoc Township, strikes in a general north-of-east direction, and can be readily followed for a distance of two miles, stained, rusty and decomposed schists being discernible throughout that distance.

Queensboro Mine.—Lot 11, concession XI., Madoc Township, Hastings County. This property is located about one mile southwest of the Village of Queensboro, and one-half mile west of the Bay of Quinte Railway.

The deposit lies in a depression at the contact of a garnetiferous crystalline schist to the south, resembling that at Hungerford, and an intrusion of light grey granite to the north.

A small spring creek ran through the depression over a part of the deposit. This it was necessary to divert, and a shaft was sunk at the edge of the old creek bed, to a depth of 85 feet. At 50 feet in depth water came in to such an extent that a drift was driven to the east for 30 feet and a cistern was constructed into which the water was trapped by means of wall plates and troughs. At the bottom of the shaft, a drift has been run to the west for 25 feet, and a cross cut made 20 feet to the north. A drift was also driven to the west on the 50-foot level.

One hundred and fifty feet to the west another shaft has been sunk to a depth of 30 feet.

||Managing Director, B. A. C. Craig, National Club, Toronto; Mine Office, Tweed, Ont.
**In July, 1911.
††1911. The mine was closed near the end of this year.

About 100 feet southwest of the main shaft, a zone of highly pyritous rock was worked. Through this ran several lenses, up to 4 to 5 feet in thickness, of medium grade pyrite, shading off into leaner ore. One lens contains disseminated copper pyrites, which was worked by an open pit.

The mine was operated by the British American Development Company of Toronto.

The pyrite was hauled by teams to Queensboro Station and there shipped to the Contact Process Company at Buffalo. The first 21 cars shipped average 47 per cent. sulphur, and shipments up to the fall of 1906 amounted to 65 carloads.

The highest grade ore comes from a series of lenses close to the granite contact. That on which the main shaft is sunk has, at the shaft, a width of 15 feet and a length of about 50 feet, thinning out towards the ends. To the west is a similar lens, which shows a width, in a surface trench, of 20 feet of very high grade pyrite. The iron pyrites in these lenses is a hard, heavy, dense ore resembling a massive magnetite, the only impurity being thin veinlets of quartz. To the south is an extensive area of more or less imperfect impregnation, showing places from which a 35 per cent. sulphur ore can be quarried.

A noteworthy feature of this deposit is a small vein to the west of the workings which has a northwest strike and is about 2 feet wide. It has been opened by a trench 16 feet long and 4 feet deep. It cuts the formation at an angle of 45 degrees, and appears to possess well defined walls. The vein is composed of quartz, pyrite, copper pyrite and argentiferous jamesonite. This vein is of later age than the pyrite deposit. The jamesonite fills the interstices and is formed around crystals of pyrite. This vein possesses an interest on account of the rare occurrence of jamesonite in this country, and the present high price of antimony.

Canadian Sulphur Ore Company's Property.‡‡—N. ½ Lot 9, Concession X., Madoc. When this property was investigated by Mr. Fraleck in 1906, a series of pits and trenches had disclosed a belt of gossan over 500 feet in length, about 200 feet in width, and about 12 feet in depth. The gossan was mainly conglomerate with iron oxide as a cementing material; certain portions were a fairly good limonite. Here and there throughout the gossan, were found pyrite boulders up to 12 feet in diameter, but the ore body had not been located.

Subsequent prospecting and development has disclosed pyrite ore in a series of lenses in a fahlband, occurring in rocks of pre-Cambrian age. The lenses vary in width up to 20 feet. The ore is high grade, very little cobbing, if any, having to be done, and cars have been shipped running 40 to 48 per cent. sulphur. The ore is free from arsenic, zinc, lead, copper and calcium. It burns very satisfactorily, and is in good demand by sulphuric acid makers. The output goes mainly to Sulphide, Ontario, and to Buffalo, N.Y.

The main shaft is now down 135 feet, and a second shaft 400 feet west is down 50 feet. The property is equipped with an 80 h.p. steam boiler, 3-drill air compressor, steam hoist, air drills, pumps, and other necessary machinery. There is a comfortable boarding house for the men, and an office building. The property is still in the early stages of development, but the company expect to ship, shortly, at the rate of 30 tons a day.

The operating company is the Canadian Sulphur Ore Company, Limited, of which Mr. A. Longwell is president, and A. B. Willmott, secretary and treasurer. The head office is 404 Lumsden Building, Toronto, and the mine address is Queensboro, Ontario.

‡‡Formerly Wellington Prospect.

(To be continued.)

## WANTED—AN INTELLIGENCE BUREAU

(By Our Special Correspondent.)

At a recent mining meeting a speaker directed attention to the position of Canada in nickel and silver. His reluctance to include asbestos among the "first raters" was probably due to the unpopularity of the theme. A writer to the Mineral Industry* says, in part, "A decision of the directors to default payment of the interest on their consolidated bonds came as no surprise to the public at the end of 1911. The asbestos market has been depressed, but the mines are in excellent condition." A writer to the Journal summarizes the state of affairs by affirming that the cause of the late depression was overproduction and the remedy lay in the hands of the producer.

There may be a considerable divergence of opinions regarding the reactionary causes of such a depression, but any movement tending to stimulate and maintain a healthy condition of the industry would be welcome and to this end I would suggest an Intelligence Bureau at Quebec, and including in its functions:

Publicity.—There is no doubt that the major portion of the ills of the past depression were due to lack of intelligent, unprejudiced information. Overcapitalization would otherwise not appear so reasonable, and the manipulator of spurious properties would have a less successful task.

The regular issuing of statistics relative to foreign production might serve a valuable end. There appears in the London Mining Journal notice of a movement to form a syndicate to better organize and regulate the Russian asbestos trade. Undoubtedly, Canadian asbestos stands first in quality and quantity of ore, but judicious foresight will be safe policy.

Director Brock some time ago drew attention to the need of an inventory of mineral claims. This work could well be undertaken by such a bureau, and could embrace the metal and non-metallic claims throughout the province.

Experiments.—There is at present a wide difference of opinion regarding the character of the machines necessary for milling asbestos fibre. A series of anthentic tests would assist in standardizing these machines. Tests might also be made to find new uses for asbestos. The manufacturer is probably in the best position to carry on such tests, as he is also in extending the market for new articles, but he is not as directly interested in the amount of asbestos used as the producer, i.e., it may be cement, blue or gray asbestos, so long as the sales total are satisfactory.

Local Conditions.—Bulletins issued regularly summarizing production and accumulation of stocks would be a means of regulating production. The producer is always averse to accumulating large stocks.

The labour market has been unsatisfactory during the past few years, and while the labour conditions are rather difficult, there is no doubt much could be done to improve this question to the interest of employee and employer.

Co-operation has long been a debated question. It is probably unnatural to expect co-operation between prosperous companies and those which are losing money. No doubt, however, many of the future interests of the industry will depend upon whether the producers will exert their power to protect the industry or allow competitive forces to undermine their advantages. The Bureau might assist in determining and indicating what course of procedure would be most beneficial.

## WORKMENS' COMPENSATION IN MICHIGAN.

By R. E. Hore.

During the past year most of the Michigan copper mining companies elected to operate under the provisions of the Employer's Liability and Workmen's Compensation Act of Michigan which became effective September 1st, 1912. The principles striven for in this Act are: Reasonable compensation at minimum cost for all accidents except the result of wilful fault, certainty of amount, certainty of payment, payment without litigation and prevention of accidents. Fixed sums are paid under the Act for any injury which incapacitates an employee for a period of not less than two weeks. Amounts of compensation to be paid in case of death of employee is determined by the extent to which his immediate relatives have been dependent for support on his earnings. If employee leaves dependents wholly dependent upon him, the compensation is a weekly payment of one-half his average weekly wages, but not more than $10 nor less than $4 a week for 300 weeks. For complete disability the compensation is at the same rate for 500 weeks, the total not to exceed $4,000.

The compensation for partial disability is provided for as follows:

"While the incapacity for work resulting from the injury is partial, the employer shall pay, or cause to be paid as hereinafter provided, to the injured employee a weekly compensation equal to one-half the difference between his average weekly wages before the injury and the average weekly wages which he is able to earn thereafter, but not more than ten dollars a week; and in no case shall the period covered by such compensation be greater than three hundred weeks from the date of the injury. In cases included by the following schedule the disability in each such case shall be deemed to continue for the period specified, and the compensation so paid for such injury shall be as specified therein, to wit:

"For the loss of a thumb, fifty per centum of the average wages during sixty weeks;

"For the loss of a first finger, commonly called index finger, fifty per centum of average weekly wages during thirty-five weeks;

"For the loss of a second finger, fifty per centum of average weekly wages during thirty weeks;

"For the loss of a third finger, fifty per centum of average weekly wages during twenty weeks;

"For the loss of a fourth finger, commonly called little finger, fifty per centum of average weekly wages during fifteen weeks;

"The loss of the first phalange of the thumb, or of any finger, shall be considered to be equal to the loss of one-half of such thumb, or finger, and compensation shall be one-half the amounts above specified;

"The loss of more than one phalange shall be considered as the loss of the entire finger or thumb; Provided, however, that in no case shall the amount received for more than one finger exceed the amount provided in this schedule for the loss of a hand;

"For the loss of a great toe, fifty per centum of average weekly wages during thirty weeks;

"For the loss of one of the toes other than a great toe, fifty per centum of average weekly wages during ten weeks;

"The loss of the first phalange of any toe shall be considered to be equal to the loss of one-half of such toe, and compensation shall be one-half of the amount above specified;

"The loss of more than one phalange shall be considered as the loss of the entire toe;

"For the loss of a hand, fifty per centum of average weekly wages during one hundred and fifty weeks;

"For the loss of an arm, fifty per centum of average weekly wages during two hundred weeks;

"For the loss of a foot, fifty per centum of average weekly wages during one hundred and twenty-five weeks;

"For the loss of a leg, fifty per centum of average weekly wages during one hundred and seventy-five weeks;

"For the loss of an eye, fifty per centum of average weekly wages during one hundred weeks;

"The loss of both hands, or both arms, or both feet, or both legs, or both eyes, or of any two thereof, shall constitute total and permanent disability."

As stated by the accident industrial board, the theory of the compensation law is based on the assumption that when a worker is injured in an industry, the loss to him was occasioned by the industry, and that the product of that industry should be charged with his losses, and should pay for them. The law should be supported to the end that injured workmen may receive justice, that employers may have fixed liabilities and escape the embarrassment and expense of damage suits, that the courts be relieved of the time of trying damage suits, that the public treasury be relieved of the expense of caring for the victims of industrial accidents, that more harmonious relations be promoted between employers and employees.

In the past those injured in Michigan copper mines have been, for the most part, taken care of by benefit associations. For the year 1910 twelve copper mining companies reported a total of 53 fatal and 4,212 non-fatal accidents. The injured received from benefit associations, $87,133.75; directly from employers, $4,-523.45 and by settlements out of court, $5,418.00.

## THE EIGHT HOURS ACT.

An Act to amend The Mining Act of Ontario in respect to the House of Underground Employment.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Onario, enacts as follows:—

1. The Mining Act of Ontario is amended by inserting therein the folowing section:—

159.—(1) No workman shall remain or be allowed to remain underground in any mine for more than eight hours in any consecutive twenty-four hours, where the employer obtains from the Inspector a certificate that the means and methods in use at the mine of getting to and from the place of work in the mine are proper and satisfactory, shall be reckoned from the time of arriving at such place of work until the time of leaving such place, otherwise such eight hours shall be reckoned from the time of leaving the surface until the time of returning to the surface, or in such other way as the Inspector may direct; provided, however, that

(a) Time taken for lunch, not exceeding one half hour, need not be reckoned as part of such eight hours;

(b) A Saturday shift may work longer hours for the purpose of avoiding work on Sunday or changing shift at the end of the week or giving any of the men a part holiday.

(c) The said limit of time shall not apply to shift bosses, pump men, or persons engaged solely in surveying or measuring, nor shall it apply in cases of emergency where life or property is in imminent danger, or in any case of repair work, or to any mine where the number of men working in a shift does not exceed six.

(2) In this section

"Workman" means any person employed underground in a mine who is not the owner or agent or an official of the mine.

"Shift" means any body of workmen whose hours for beginning and terminating work in the mine are the same or approximately the same.

(3) Where any question or dispute arises as to the meaning or application of paragraph (c) of sub-section 1, or as to the meaning of "workman," "shift," or "underground," the certificate of the Inspector shall be conclusive.

(4) For greater certainty it is hereby declared that sections 174, 175, 179, 180 and 181 of this Act shall apply to contraventions of this section; provided, however, that a workman shall not be guilty of an offence for failure to return to the surface within the time limited by this section if he proves that without fault on his part he was prevented from returning owing to means not being available for the purpose.

(5) In the event of great emergency or grave economic disturbance, the Lieutenant-Governor in Council may suspend the operation of this section to such extent and for such period as he deems fit; or upon the Inspector certifying as regards any iron mine that the precautions, safeguards, and arrangements for protecting the health, safety and comfort of the workmen employed therein are satisfactory and in compliance with this Act, the Lieutenant-Governor in Council may, upon the recommendation of the Minister, in like manner suspend the operation of this action in so far as such mine is concerned.

(6) This section shall come into effect on the first day of January, 1914.

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# ANNUAL REPORT OF HOLLINGER GOLD MINES LIMITED

## GENERAL MANAGER'S REPORT

The President and Directors,
Hollinger Gold Mines, Limited.

Dear Sirs.—

I beg to submit my second annual report, covering operations for the year 1912.

### FINANCIAL.

Operations were considered to begin July 1st, when the mill went regularly into commission, and all expenditures previous to that date were charged to "Plant" and "Development."

The sale of the balance of treasury stock (50,000 shares), at a premium of $5.00 per share, enabled all indebtedness to be cleared, and left the Company in possession of its mine and mill, fully paid for and in a productive condition.

Profits of $600,664.42 were earned during the last half of the year, in spite of the facts that mine and mill had to be worked up to a condition of smooth running, and that the last six weeks of the year were entirely devoted to fighting a labour strike.

As shown by the balance sheet, substantial amounts were written off from both "Plant" and "Development." It is well to point out that while "Development" stood at $302,639.19 there was an additional sum of $192,333.52 which had been actually expended by the original syndicate in development and upon road building, but which sum was not chargeable upon this Company's books. In fact, "Development," up to July 1st, 1912, had cost $494,972.71, so that the asset of $180,000.00, which is carried forward to 1913, represents a very conservative valuation; this with the carrying forward of plant at $500,000.00, after writing off $106,223.54 for depreciation, leaves the Balance Sheet with no fictitious values ascribed to assets, and with a surplus of $351,801.69, largely made up of cash, bullion and convertible sundries.

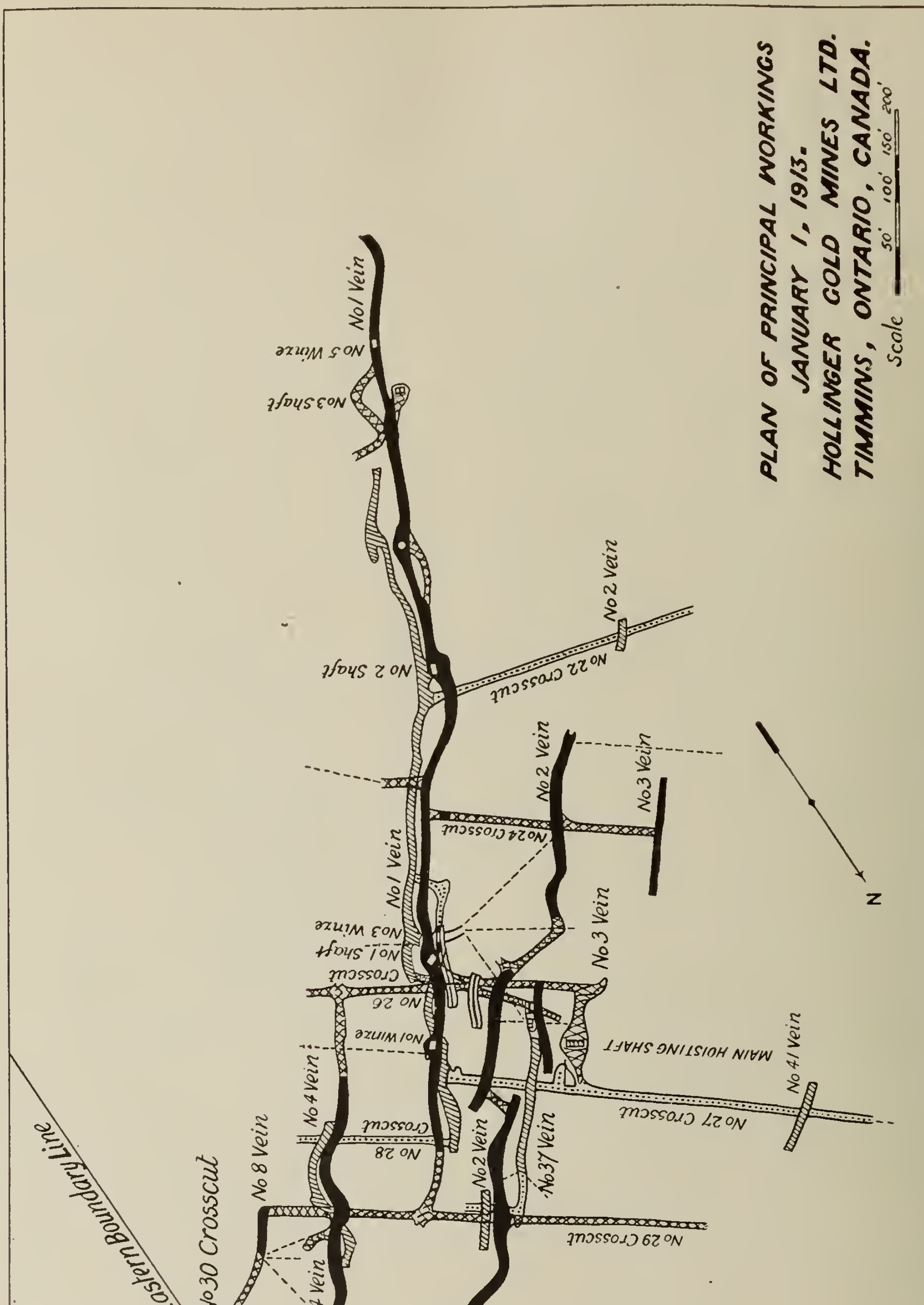
### THE MINE.

The following work was accomplished during theyear:

| | Drifts. | Crosscuts. | Winzes. | Raises. | Shafts. | Stopes. |
|---|---|---|---|---|---|---|
| 100-ft. level | 1,802 ft. | 401 ft. | 121 ft. | 60 ft. | ..... | 23,973 tons |
| 200-ft. level | 1,299 ft. | 820 ft. | 203 ft. | 90 ft. | 66 ft. | 6,767 tons |
| 300-ft. level | 179 ft. | 160 ft. | ...... | ..... | ..... | .......... |
| Totals | 3,280 ft. | 1,381 ft. | 324 ft. | 150 ft. | 66 ft. | 30,740 tons |

The total advance of workings amounted to 5,201 feet. Our underground workings now total 8,918 feet, distributed as follows:

| | Drifts. | Crosscuts. | Winzes. | Raises. | Shafts. |
|---|---|---|---|---|---|
| 100-ft. level | 3,141 ft. | 1,508 ft. | 224 ft. | 142 ft. | 362 ft. |
| 200-ft. level | 1,719 ft. | 1,096 ft. | 227 ft. | 90 ft. | 70 ft. |
| 300-ft. level | 179 ft. | 160 ft. | ...... | ...... | ...... |
| Totals | 5,039 ft. | 2,764 ft. | 451 ft. | 232 ft. | 432 ft. |


PLAN OF PRINCIPAL WORKINGS
JANUARY 1, 1913.
HOLLINGER GOLD MINES LTD.
TIMMINS, ONTARIO, CANADA.
Scale 50' 100' 150' 200'
N
Drifts and ore 100ft Level
Drifts and ore 200ft Level
Drifts and ore 300ft Level
Crosscuts —— 100ft Level
Crosscuts —— 200ft Level
Crosscuts —— 300ft Level
Diamond drill holes
Eastern Boundary Line
No 30 Crosscut
No 38 Vein
No 8 Vein
No 4 Vein
No 2 Vein
No 37 Vein
No 29 Crosscut
No 28 Crosscut
No 27 Crosscut
No 41 Vein
MAIN HOISTING SHAFT
No 1 Winze
No 26 Crosscut
No 1 Shaft
No 3 Winze
No 3 Vein
No 1 Vein
No 24 Crosscut
No 22 Crosscut
No 2 Shaft
No 3 Shaft
No 5 Winze

## DIAMOND DRILLING.

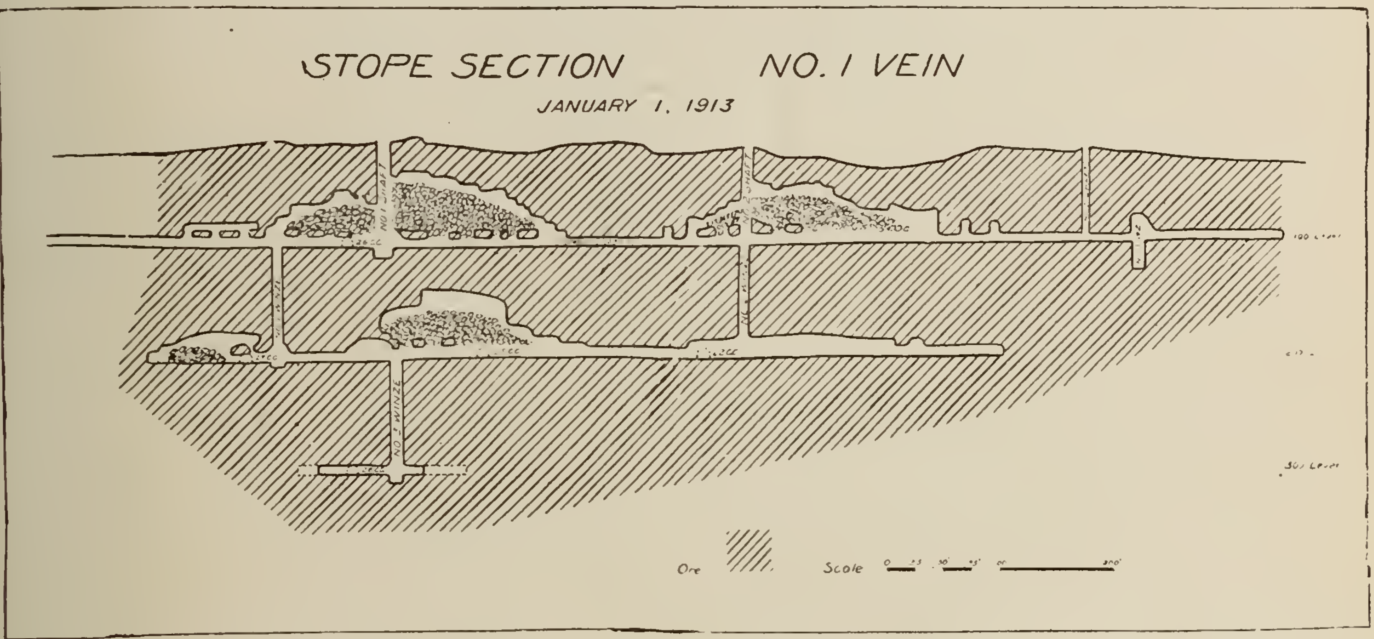
Prospecting by means of a diamond drill has been carried on with beneficial results, the amount of drilling being as follows:

| | |
|---|---|
| 100-ft. level | 588 ft. |
| 200-ft. level | 800 ft. |
| 300-ft. level | 78 ft. |
| Total | 1,466 ft. |

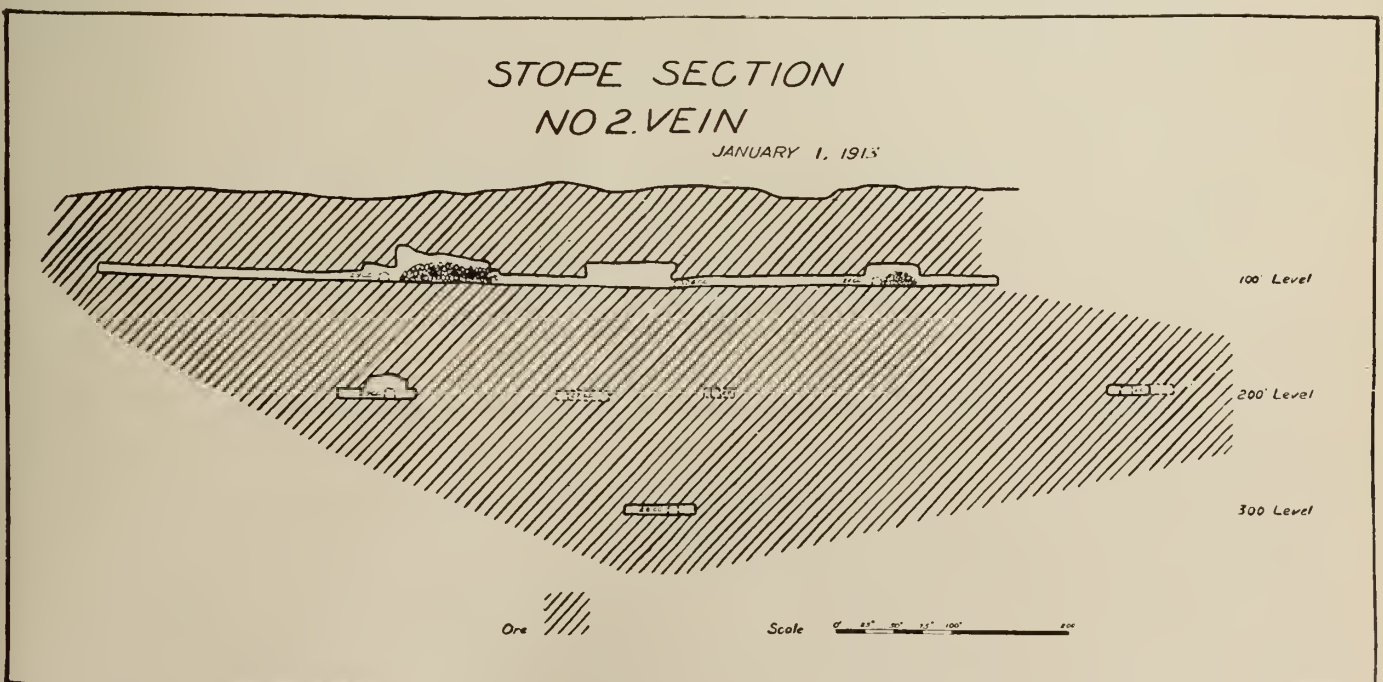
## ORE RESERVES.

Estimates of ore reserves are based upon the results of development, as shown upon the accompanying "Stope Sections" and plan.

Making allowances, as shown in the stope sections, the indicated ore reserves are estimated to be:



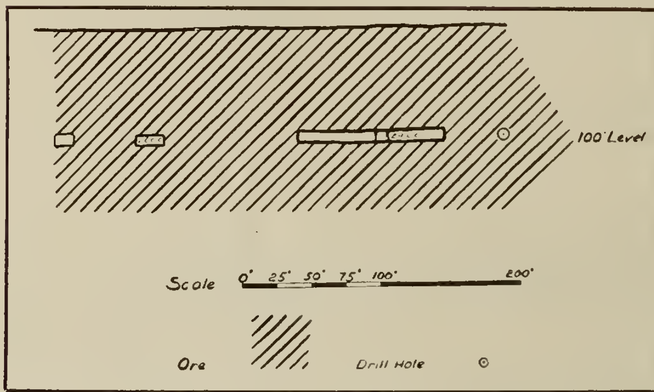

| Number 1 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level | 42,700 | $1,229,700.00 |
| Above 200-ft. level | 78,700 | 2,560,800.00 |
| Above 300-ft. level | 75,400 | 1,960,400.00 |
| Below 300-ft. level | 12,000 | 275,200.00 |
| Total | 208,800 | $6,026,100.00 |



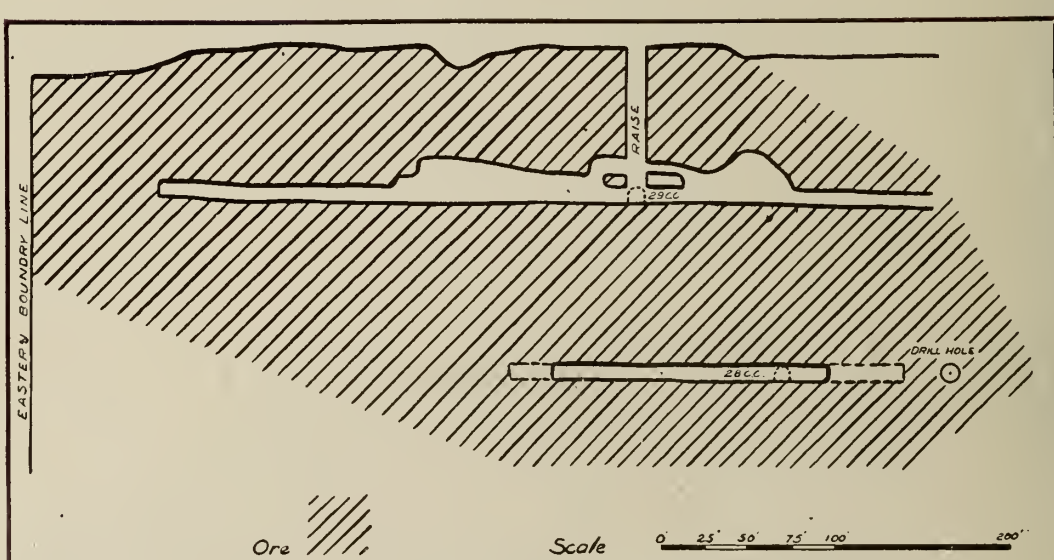

| Number 2 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level | 48,560 | $ 672,480.00 |
| Above 200-ft. level | 76,800 | 1,025,970.00 |
| Above 300-ft. level | 65,780 | 829,700.00 |
| Below 300-ft. level | 10,660 | 120,100.00 |
| Total | 201,800 | $2,648,250.00 |

STOPE SECTION No. 3 VEIN

*January 1, 1913*




| Number 3 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 13,650 | $102,000.00 |
| Below 100-ft. level..... | 8,950 | 67,000.00 |
| Total........... | 22,600 | $169,000.00 |

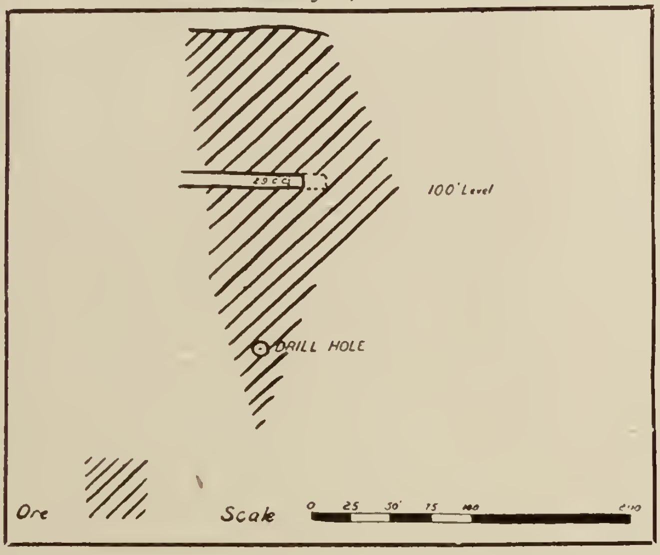



**Stope Section, No. 4 Vein.**

January 1, 1913.

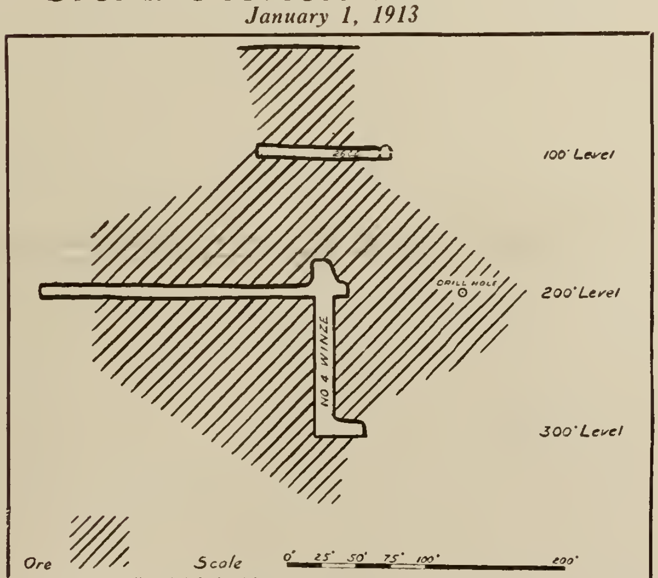
| Number 4 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 31,800 | $ 378,800.00 |
| Above 200-ft. level..... | 40,700 | 502,200.00 |
| Below 200-ft. level..... | 11,800 | 131,000.00 |
| Total........... | 84,300 | $1,012,000.00 |

STOPE SECTION No. 8 VEIN
January 1, 1913




| Number 8 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 4,920 | $49,200.00 |
| Below 100-ft. level..... | 4,580 | 27,950.00 |
| Total............ | 9,500 | $77,150.00 |

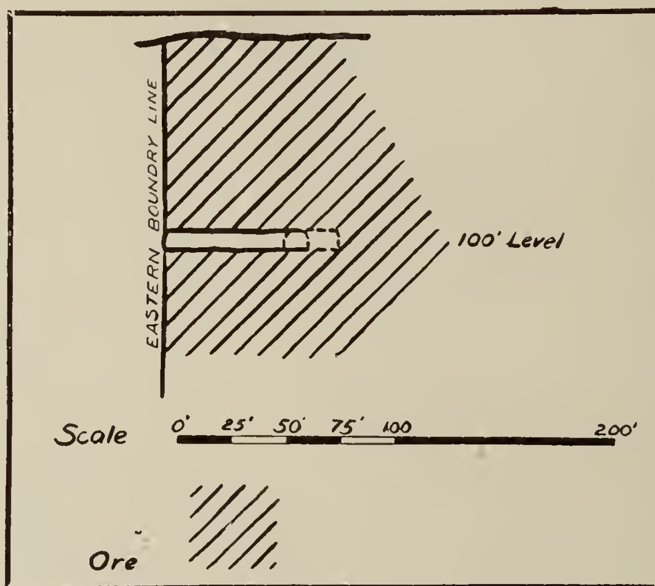
STOPE SECTION No. 37 VEIN
January 1, 1913




| Number 37 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 3,960 | $ 39,600.00 |
| Below 100-ft. level..... | 13,240 | 150,900.00 |
| Above 200-ft. level..... | 13,600 | 190,400.00 |
| Below 200-ft. level..... | 2,000 | 20,000.00 |
| Total............ | 32,800 | $400,900.00 |

## STOPE SECTION No. 38 VEIN

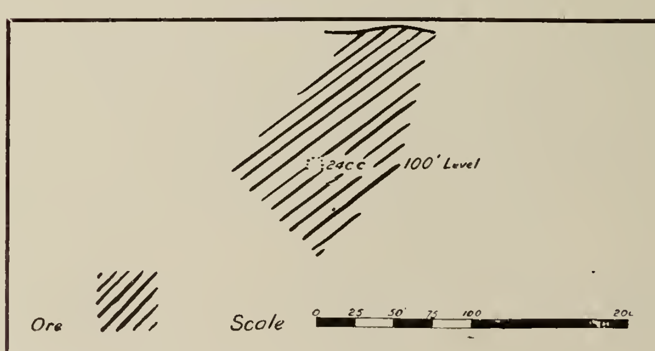
*January 1, 1913*




| Number 38 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 5,000 | $ 77,500.00 |
| Below 100-ft. level..... | 3,100 | 46,500.00 |
| Total............ | 8,100 | $124,000.00 |

## STOPE SECTION No. 40 VEIN

*January 1, 1913*




| Number 40 Vein— | Tons. | Value. |
|---|---|---|
| Above 100-ft. level..... | 3,220 | $58,600.00 |
| Below 100-ft. level..... | 1,220 | 22,200.00 |
| Total............ | 4,440 | $80,800.00 |
| Number 41 Vein— | | |
| Above 200-ft. level..... | 1,100 | $16,600.00 |
| Below 200-ft. level..... | 1,000 | 16,600.00 |
| Total............ | 2,200 | $33,200.00 |

**RECAPITULATION OF ORE RESERVES.**

| | Tons. | Value. | Estimated at Beginning of 1912. |
|---|---|---|---|
| No. 1 Vein...... | 208.800 | $6.026.100.00 | $7,560,000.00 |
| No. 2 Vein...... | 201.800 | 2.648.250.00 | 1.200.000.00 |
| No. 3 Vein...... | 22.600 | 169.000.00 | 150,000.00 |
| No. 4 Vein...... | 84.300 | 1,012.000.00 | 450,000.00 |
| No. 8 Vein...... | 9.500 | 77,150.00 | 140,000.00 |
| No. 37 Vein...... | 32.800 | 400.900.00 | ......... |
| No. 38 Vein...... | 8.100 | 124,000.00 | ......... |
| No. 40 Vein...... | 4.440 | 80,800.00 | ......... |
| No. 41 Vein...... | 2,200 | 33.200.00 | ......... |
| Veins 5, 7, 9, 11, 12, 13, 14, 23, 33, 35, 36, 39, 42 and 43........ | 70.000 | 700.000.00 | 730,000.00 |
| Totals...... | 644.540 | $11.271,400.00 | $10,230,000.00 |

The total value estimated in my report of a year ago was $10,230,000.00, and during the time between reports we have milled $970,304.89 from the previously estimated reserves.

The year has been spent in proving up previous estimates, and it will be noted that, with the exception of Number 1 Vein and Number 8 Vein, there is a general increase in the values ascribed to the various ore bodies.

The original reserves of No. 1 Vein were estimated upon the basis of a solid block of ore 300 feet in depth, while the present estimate is based upon more extensive development and does not include so large a block of ore as was included in last year's figure. Further, during 1912, approximately $760,000.00 was removed from the estimated reserves of No. 1 Vein.

We are now assured of the prevalence of ore to a depth of 300 feet, and there is no known reason why it should not be found at considerably greater depths, but in order to become established upon a conservative basis, no allowance has been made for ore which may exist beyond a depth of 50 feet below the deepest working of any vein.

Compared with a year ago, our position in the matter of ore reserves has been greatly strengthened, for our present estimates are the result of development work, and the estimated values per ton have been substantiated by the milling of 45.195 tons of ore.

There are 34 known veins upon which no work has been done, other than sampling the surface outcrops. As in last year's report, these are included in ore reserves at arbitrary nominal figures.

Veins 37, 38, 39, 40, 41, 42 and 43 are new discoveries made during the year.

In last year's estimates, No. 8 Vein was figured to a depth of 200 feet, while this year it is figured to a depth of 150 feet, the reduction being made in accord with the policy of limiting estimates to a depth of 50 feet below the workings.

In the mine there are 24 faces which carry ore and which are available as working places. They are:

100-foot level—
- No. 2 Vein, south of 26 crosscut.
- No. 3 Vein, south face.
- No. 3 Vein, north face.
- No. 3 Vein, south of 26 crosscut.
- No. 8 Vein, south face.
- No. 38 Vein, south of 30 crosscut.

200-foot level—
- No. 1 Vein, south face.
- No. 1 Vein, north face.
- No. 2 Vein, south of 29 crosscut.
- No. 2 Vein, north of 29 crosscut.
- No. 2 Vein, south of 27 crosscut.
- No. 2 Vein, south of 26 crosscut.
- No. 2 Vein, north of 26 crosscut.
- No. 2 Vein, south of 22 crosscut.
- No. 2 Vein, north of 22 crosscut.
- No. 4 Vein, north of 28 crosscut.
- No. 4 Vein, south of 28 crosscut.
- No. 37 Vein, south of 26 crosscut.

300-foot level—
- No. 1 Vein, north face.
- No. 1A Vein, south face.
- No. 1 Vein, south face.
- No. 2 Vein, north face.
- No. 2 Vein, south face.
- No. 37 Vein, north face.

In addition to this work there is a large amount of crosscutting to do, besides the necessary raises and winzes for development.

There is also the opening up of various groups of veins which have been exposed upon the surface, but which are too far removed to be reached expeditiously from the main workings.

Altogether there is room for from 25 to 30 drills to be used upon development work alone. This, in conjunction with the drills required for stoping ore to feed the mill, creates a demand for compressed air sufficient to operate about 55 drills, and there is the further demand for air with which to operate hoists, pumps and diamond drills.

The foregoing is given by way of explaining why we have not made more headway in sinking to greater depths. The opening up of the mine upon the upper levels has at all times demanded air in excess of the capacity of our plant.

The electrical apparatus for driving our 14-drill compressor having been destroyed by fire, it was not until the middle of February that this could be replaced, and until that time we had but a small 6-drill machine in operation.

Subsequently another 15-drill compressor was placed at work and a third machine of this size has just been installed upon the adjoining Dixon claim; the surplus air from this latter compressor will be available for use in the Hollinger mine.

The temporary equipment of compressors now installed will serve for the present, and meanwhile a central air compressing plant is being planned which will be of a permanent nature and of sufficient capacity to supply future requirements.

From November 15th to the end of the year, work in the mine was at a standstill, owing to the labour troubles which unexpectedly arose, this cessation resulting in a further reduction in the amount of work accomplished during the year.

The ore hoisted during the year amounted to 36,446 tons. All of this, together with ore previously placed upon the dump, was milled, the total amounting to 45,195 tons and containing $970,304.89, of which amount $933,681.53 was recovered. In the total values recovered, silver amounted to $6.546.93 and gold $927,134.60.

The average value of all ore treated was $21.44 per ton, including the low grade ore sent to the mill at the commencement of millin goperations, and that milled during the strike.

We have now recovered sufficiently from the effects of the strike to enable sinking operations to be resumed, and we propose to continue No. 3 Winze to the 400-foot level at once.

The raising of the main shaft from 300 to 200-foot level will also be undertaken at once, and when this is completed the shaft will be continued down to 400 feet.

## THE MILL.

The first stamps were dropped June 15th and for two weeks nothing was treated but waste rock and very low grade ore, until the usual mechanical defects, incident to a new mill, were made right.

Early in July, cyaniding was commenced and the mill was put into regular operation. Beginning with June 15th, the following tonnages were treated, the figures being for four-week periods:

| | Tons Treated. | Values Recovered. |
|---|---|---|
| June 15—July 13 | 4,447 | $ 23,129 |
| July 14—Aug. 10 | 6,132 | 152,437 |
| Aug. 11—Sept. 7 | 7,606 | 171,634 |
| Sept. 8—Oct. 5 | 7,905 | 197,657 |
| Oct. 6—Nov. 2 | 8,012 | 189,685 |
| Nov. 3—Nov. 30 | 6,335 | 122,931 |
| Dec. 1—Dec. 31 | 4,758 | 76,209 |
| Totals | 45,195 | $933,682 |

It will be noted that up to November, steady progress was made toward increasing both tonnages and values of ore treated.

November and December showed a falling off due to the strike.

The mill has operated in a satisfactory manner, and experience has demonstrated that the process adopted is the correct one for the treatment of Hollinger ores.

Originally our practice was to amalgamate concentrates in pans, in order to remove the contained values, but after several months of experimenting, amalgamation was abandoned in favour of the cyanidation of the concentrates. This necessitated no change in apparatus, the substitution of potassium cyanide for mercury, in the grinding pans, being all that was required.

The agitators which were adopted at the start did not prove to be adapted to the handling of our heavy ores, and we have therefore discarded the Trent apparatus in favour of Dorr Thickeners. For the benefit of the uninitiated it may be stated that the above change merely involves the substitution of one type of stirring arms for another, in an ordinary round tank.

By the substitution of the Dorr mechanism we are enabled to practice continuous decantation, which is expected to result in an increased saving of dissolved values, and may possibly enable a considerable saving in treatment charges to be made by making it possible to do away with the comparatively expensive item of filtering.

It was intended to make these changes before the end of last year, but our plans were upset by labour troubles and it is not expected that the work will be completed before May 1st.

## WORKING COSTS.

The year's work having been so badly deranged, statistical data in regard to costs would be meaningless.

It will be some months before work in the various departments will be brought up to a state of efficiency, but the costs for February, 1913, are given, as they are indicative of what may be expected, although they are inordinately high.

## MINING COSTS.

### Four Weeks Ending February 25th, 1913.

| Account— | Labour. | Stores. | Total. | Per Ton of Ore Milled. |
|---|---|---|---|---|
| General Mining Charges | $ 363.31 | $ 124.02 | $ 487.33 | $0.053 |
| Superintendence | 1,160.95 | ...... | 1,160.95 | .126 |
| Diamond Drilling | 162.97 | 87.72 | 250.69 | .027 |
| Crosscutting | 145.34 | 255.61 | 400.95 | .043 |
| Drifting | 1,868.54 | 1,256.84 | 3,125.38 | .338 |
| Raising | 43.86 | 21.16 | 65.02 | .007 |
| Stoping | 7,895.77 | 6,709.53 | 14,605.30 | 1.581 |
| Timbering Stopes | 1,837.06 | 183.73 | 2,020.79 | .219 |
| Track Laying | 70.06 | 50.20 | 120.26 | .013 |
| Tramming and Mucking | 4,042.04 | 6.34 | 4,048.38 | .438 |
| Pipe Fitting Underground | 133.40 | 256.83 | 390.23 | .042 |
| Mine Drainage | 130.71 | 335.53 | 466.24 | .050 |
| Hoisting | 837.27 | 734.21 | 1,571.48 | .170 |
| Landing and Dumping | 583.38 | ...... | 583.38 | .063 |
| Drill Repairs | 138.67 | 847.67 | 986.34 | .107 |
| Drill Sharpening | 1,262.30 | 36.48 | 1,298.78 | .141 |
| Distributing Steel | 460.03 | ...... | 460.03 | .050 |
| Mine Sampling | 372.33 | 8.60 | 380.93 | .041 |
| Assaying | 72.81 | 80.11 | 152.92 | .017 |
| Change House | 70.00 | ...... | 70.00 | .008 |
| Mine Lighting | 30.49 | 15.94 | 46.43 | .005 |
| Handling Explosives | 227.90 | 3.87 | 231.77 | .025 |
| Handling Waste | 147.75 | ...... | 147.75 | .016 |
| Surveying | 76.47 | ...... | 76.47 | .008 |
| | $22,133.41 | $11,014.39 | $33,147.80 | $3.588 |

## MILLING COSTS.

**Four Weeks Ending February 25th, 1913.**

| Account— | Labour. | Stores. | Total. | Per Ton of Ore Milled. |
|---|---|---|---|---|
| General Milling Charges | $1,117.98 | $ 357.18 | $1,475.16 | $0.160 |
| Superintendence | 694.94 | ...... | 694.94 | .075 |
| Tailings Disposal | ...... | 1.72 | 1.72 | .... |
| Heating | 384.92 | 314.78 | 699.70 | .076 |
| Lighting | 24.50 | 161.63 | 186.13 | .020 |
| Watchman | 79.80 | ...... | 79.80 | .009 |
| Sampling | 55.53 | .40 | 55.93 | .006 |
| Assaying | 145.62 | 160.23 | 305.85 | .033 |
| Coarse Crushing | 410.66 | 264.00 | 674.66 | .073 |
| Conveying | 221.17 | 92.35 | 313.52 | .034 |
| Stamping | 786.30 | 885.94 | 1,672.24 | .181 |
| Classification and Tube Milling* | 491.06 | 2,067.91 | 2,558.97 | .277 |
| Concentration | 415.11 | 113.67 | 528.78 | .057 |
| Handling Concentrates | 28.84 | 86.66 | 115.50 | .012 |
| Grinding Concentrates | 158.83 | 170.87 | 329.70 | .036 |
| Handling Pulp | 71.78 | 131.09 | 202.87 | .022 |
| Thickening | 91.03 | 19.35 | 110.38 | .012 |
| Agitation | 103.62 | 167.68 | 271.30 | .029 |
| Filtration | 908.46 | 448.35 | 1,356.81 | .147 |
| Acid Washing | 27.08 | 92.00 | 119.08 | .013 |
| Neutralizing | 109.56 | 100.50 | 210.06 | .023 |
| Clarification and Precipitation | 107.42 | 576.51 | 683.93 | .074 |
| Smelting and Retorting | 151.16 | 432.97 | 584.13 | .063 |
| Pumping Solutions | 115.14 | 72.01 | 187.15 | .020 |
| Cyanide | ...... | 381.22 | 381.22 | .041 |
| | $6,700.51 | $7,099.02 | $13,799.53 | $1.493 |
| Extraordinary Expenditures (alterations) | 953.60 | 891.33 | 1,844.93 | .200 |
| | $7,654.11 | $7,990.35 | $15,644.46 | $1.693 |

*Classification and tube milling include the cost of repairing the linings of three tube mills.

## TOTAL OPERATING COSTS.

**Four Weeks Ending February 25th, 1913.**

| | Amount | Per Ton of Ore Milled |
|---|---|---|
| Administration, Management, Insurance, etc. | $ 3,763.54 | $0.407 |
| General Charges | 1,931.08 | .209 |
| Clearing Surface, Roads, etc. | 137.75 | .015 |
| Mining | 33,147.80 | 3.588 |
| Milling | 13,799.53 | 1.493 |
| Operating Camp | 2,415.96 | .261 |
| Extraordinary Expenditures | $55,195.66 | $5.973 |
| Loss on Temporary Boarding Houses | 384.70 | .042 |
| Alterations to Mill and Plant | 2,034.51 | .221 |
| Strike Expense | 4,695.37 | .508 |
| | $62,310.24 | $6.744 |

Mining costs are admittedly high. We are working with a force of men collected hurriedly in outside camps and brought in to replace the men who went out on strike, and this new force has not yet reached a high state of efficiency. A gradual reduction in mining costs may be expected.

Milling costs are high owing to abnormal expenditures for alterations and repairs.

Geenral costs are greatly increased by the extraordinary expenses incurred in providing protection against strikers, in quatering employees upon the mine, and inefficiency engendered by existing conditions.

Further, the figures given are for a period in midwinter, when costs of heating the camp and works are a heavy item of expense.

Substantial reductions in working costs may therefore be looked for, and it is expected that with uninterrupted working, the total costs will be brought down to approximately $5.50 per ton.

### GENERAL.

The work of the year progressed satisfactorily until November 15th, upon which date the Western Federation of Miners declared a strike, and by intimidation forced about one-half of our men to go out.

There had been no dispute between the Company and its men, and the strike was entirely unexpected.

The strike was gneral throughout the camp and was unsuccessful.

We were forced to abandon our boarding houses in the Town of Timmins and put up temporary quarters at the mine. It was also necessary for us to bring in a number of special police to protect our men and property.

The men who remained loyal enabled us to keep the mill going, and our force was gradually built up by men coming in from outside camps.

The working conditions are better here than elsewhere in Ontario. We pay from $3.25 to $3.75 per day for skilled labour, and from $2.50 to $3.00 for unskilled. Bed and board are furnished for 60 cents per day. Nine hours constitutes a day's work in the mine, and eight-hour shifts are worked in the mill.

The strike has gradually dwindled until there are now (March 19th) 1,200 men at work in the camp, of which number approximately 500 are employed by this Company.

Some 150 men are actively engaged in trying to interfere with those who wish to work. This small number of malcontents is largely made up of professional agitators surrounded by a following of incompetents who have availed themselves of the opportunity to put in a winter of idleness, meanwhile being supported and fed by donations received from outside labor organizations.

It is hoped that the Government will rid the district of this undesirable element.

Directly and indirectly the tsrike has cost the Company fully $100,000.00, besides the intangible loss due to the disorganization of all departments.

### HOSPITAL.

A comfortable hospital has been provided by Canadian Mining & Finance Co., Ltd., in the Town of Timmins, the use of which is open to employees of the Hollinger mines.

### BUNK HOUSES.

Up to the present the only bunk houses available have been those provided by Canadian Mining & Finance Co., Ltd., but we are now constructing three bunk houses at the mine which will accommodate 150 men in ordinary times, and which may be used for 300 men in times of emergency. These are to have plastered rooms, two men in a room.

Ten cottages for married men have been built in the town. It is possible that we may find it necessary to increase this number.

### POWER SUPPLY.

Electric power developed from hydro-electric plants upon the Mattagami River has proved entirely satisfactory. The action of the directors in disposing of their holdings in the plant at Sandy Falls, in order to bring about a consolidation with the company operating Waiwaiten Falls, has made available two independent sources of power.

The two plants being distant twenty-eight miles from one another, makes a failure in power supply practically impossible either from accident or shortage of water.

### ACCIDENTS.

There is but one fatality to report as occurring during the year. A. Lahte, a miner, was instantly killed on January 9th by the blowing up of a dynamite thawing house; cause unknown.

Before closing, I wish to record my appreciation of the loyal services rendered by the Company's staff and men during the recent labour disturbances, and to thank the directors for their support during the year.

Yours truly,

P. A. ROBBINS,

General Manager.

## INTERNATIONAL COAL AND COKE COMPANY

The ninth annual report of the International Coal and Coke Co., operating coal mines and coke ovens ot Coleman, southwest Alberta, covers the calendar year ended Dec. 31, 1912. It shows a net profit of $232,198 for the 12 months, of which $132,198 was transferred to the surplus account and $100,000 has been carried forward into the working and dividend fund for the current year. The company's liabilities were reduced $139,318 and the assets were increased $92,880, while the payroll amounted to $563,906, expended during the 254 days the mines were operating, employing an average of 520 men daily. The expenditures for development, additions to plant and other necessary outlay aggregated $61,342.

The assets of the company total $3,987,443, segregated as follows: Coal lands, $3,135,955; plant, dwellings, horses, etc., $658,817; warehouse stock, $27,890; accounts receivable, $165,753; stocks of coal and coke, $2,173; unexpired insurance, $1,682; cash on hand, $172.

At the annual meeting of the company, held in Spokane, Washington, last month, the question of paying dividends quarterly was discussed. While nothing definite was decided, the secretary informed shareholders that if nothing shall occur to interrupt coal-mining operations the payment of a regular quarterly dividend might be expected.

The officers of the company are: President, Mr. A. C. Flumerfelt, Victoria, B.C.; first vice-president, Mr. Hugh Davidson, Vancouver, B.C.; second vice-president, Mr. D. H. Kizer, Spokane; treasurer, Mr. John McKeagan, Coleman, Alberta; secretary, Mr. W. G. Graves, Spokane; managing director, Mr. P. W. Riddell, Coleman; manager, Mr. O. E. S. Whiteside.

## MINE ACCIDENTS

Speaking before a large number of men employed in and about the coal mines of the Western Fuel Co., near Nanaimo, Vancouver island, B.C., Mr. Thomas Graham, chief inspector of mines for British Columbia, after having given some accident and mortality statistics, said:

"Legislation, however stringent, or supervision, however efficient, will not prevent this class of accidents. Here, so much depends upon the personal element that only by the co-operation of every person concerned, from the mine inspector and the manager down to the trapper boy, can it be hoped to reduce to a minimum the number of accidents from falls of roof and coal. At such a meeting as we have to-night, at which are present so many fire-bosses and shot-lighters, it is an opportune time to urge upon them the great necessity that exists for their unremitting co-operation, for they come daily into closer contact with all underground employes than do other mine officials; so that an occasionals word of advice, warning or admonition from them is likely to do much toward reducing the number of fatal accidents from the causes just mentioned, as well as from haulage."

The occasion of Mr. Graham's remarks was the meeting of the Western Branch of the Canadian Mining Institute, held at Nanaimo the first week in March, and these timely observations were made immediately before Mr. J. F. Menzies, of Roslyn, Washington, general superintendent of the Coal Department of the Northwestern Improvement Co., read a paper on "Mine-Rescue and First-Aid Work."

# WORK AT THE SENECA SUPERIOR MINE, PETERSON LAKE, COBALT

[Editor's Note.—Under date of April 5th, 1913, the following information was kindly provided by the management of the Seneca Superior mine. It covers in part the work done in March.]

**Surface.**—Work has been progressing satisfactorily in all departments. The new rock house is completed and operating. The ore treating equipment, consisting of bumping table, Harz jig and Deister concentrating table, is all installed and running.

A fire pump was ordered and work begun on pump house on the edge of our dump. The new thaw house was completed and connected with the shore by a substantial bridge. Work was also started on a new dry house in place of the building originally built for the purpose and which has been used as a carpenter shop.

We have completed the tests on ore from the "mill dump," sending about sixty tons to both the Dominion Reduction Company and the Nipissing Reduction Company. The results were unsatisfactory, showing in one case an assay of 4.4 ounces to the ton, and in the other 7.7 ounces. This result bears out our previous opinion and indicates that the values of the ore, instead of being scattered in the wall rock, have been confined closely to the vein matter. Until such time as our assays indicate that the wall rock is showing better value we propose to dump same into the lake and thus save our dumping area on the surface.

**Shaft No. 2.**—Work was begun sinking this shaft and will be continued night and day to meet the up-raise from the 200-ft. level.

**Peterson Lake.**—Unwatering this property was begun on the twenty-fourth ult., and at this writing the water is below the first level. We expect to have the entire mine unwatered in another week.

**Underground.**—Timbering the drift, east and west, has been steadily proceeding and stoping the ore overhead. We have also been back stoping the vein in the east preparatory to cutting hitches and timbering.

Owing to air conditions we stopped work late in the month on the No. 3 X cut and No. 1 Drift East, confining the work to stoping and driving No. 2 Crosscut. We have ordered ventilating pipe, to run from the shaft to the Worth vein and expect to have same installed in a few days when active work will be resumed at all points. The advances made during the month totalled 146 feet 11 inches.

At this date the air conditions are greatly improved and it is likely that our troubles on that account are well over, as the snow is about gone and we are having some thawing weather.

**Seneca Superior Shaft House**

**Productions and Shipments.**—

| | High Grade. | Jig Concentrates. |
|---|---|---|
| On hand March 1st | 31,092 lbs. | |
| Produced during month | 42,534 lbs. | 3,685 lbs. |
| | 73,626 lbs. | |
| Add concentrates | 3,685 lbs. | |
| | 77,311 lbs. | |
| Shipped March 18th | 60,236 lbs. | |
| High grade on hand, March 31st | 17,075 lbs. | |

In addition to above we produced 41,760 lbs. screenings, but as they will be jigged and included in later concentrates, they are not included in above estimate.

Assuming the above shipping product of the month to assay 4,000 ounces to the ton, our total ounces produced, not counting the screenings and dump, amount to 46,219 lbs. x 4,000, or 92,438 ounces.

**Accounting.**—Expenses for the month were as follows:

| | |
|---|---|
| Accounts payable. . . . . . . . . . . . . . . . . . . . . | $5,350.39 |
| Pay roll. . . . . . . . . . . . . . . . . . . . . . . . . . . | 4,373.69 |
| | $9,724.08 |

or ten and one-half cents per ounce.

# PERSONAL AND GENERAL

Mr. Wm. Fowler, well-known in the Boundary Creek district, British Columbia, where he developed the Providence, a small but rich gold-silver mine situated near Greenwood, is now in Oregon.

Mr. Archibald Dick, now retired, but formerly senior inspector of mines in British Columbia, was at the C. M. I., Western Branch, meetings in Nanaimo last month, where he heard expressed much appreciation of the value of the report on "Mine-Rescue Work in Canada," by his son, Mr. W. J. Dick, M. Sc., mining engineer for the Canadian Commission of Conservation, which report had lengthy notice in the Canadian Mining Journal of February 1st.

Mr. George Watkin Evans, of Seattle, Washington, formerly geologist in charge of the coal surveys of the State of Washington Geological Survey, who presented at the C.M.I. branch meeting at Nanaimo last month a paper on the Groundhog coal field, British Columbia, with lantern-slide illustrations, is the author of the lately-issued Bulletin No. 3 of the Washington Geological Survey, which deals with the coal measures of King County, Washington.

Mr. Leslie Hill, for years resident in Nelson, B.C., having retired from the practice of his profession of mine manager and consulting engineer, has resigned his membership in the Canadian Mining Institute. He is now livng on his fertile land near Vernon, Okanagan Valley, one of the most productive fruit-growing districts in British Columbia.

Mr. A. B. W. Hodges, formerly local manager for the Granby Consolidated M. S. and P. Co., Ltd., and resident at Grand Forks, Boundary District, B.C., for eleven or twelve years, writing from Lima, Peru, to a friend in Victoria, B.C., on January 30th, gave the following information: As my three-years' contract as general manager of the Cerro de Pasco Mining Company will terminate at the end of February, I shall be leaving Peru permanently. I expect to travel in the Northwest for several months, and hope to see my friends in Victoria and Vancouver about next July or August.

Mr. James Holden has retired from the position of superintendent for the Princeton Coal and Land Company at Princeton, Similkameen, B.C., after having had charge of the development of the company's coal mine from a prospect to its present condition of being well-opened and equipped for the production and shipment of coal.

Mr. John Hopp, of Barkerville, Cariboo, was one of the several British Columbia members who attended the annual meeting of the Canadian Mining Institute at Ottawa last month. His hydraulic placer-gold mining operations are on the largest scale of all being carried on in the Cariboo district. He has been visiting some of the larger cities of the eastern United States and Canada, prior to returning west to resume hydraulicking operations as soon as the season shall be far enough advanced to admit of his doing so.

Mr. Thos. R. Jackson, formerly of No. 2 mine. Extension Colliery, Vancouver Island, and since then with the Western Fuel Company, Nanaimo, has been appointed superintendent of that company's new mine, known as Reserve Shaft, situated between four and five miles south of Nanaimo.

Mr. Andrew G. Larson has returned to Vancouver, B.C., from a short holiday visit to Los Angeles, Cal.

Mr. J. McLellan, one of the owners of a small gold mine, at Gold or Mitchell Harbour, on the west coasts of one of the Queen Charlotte Islands, B.C., has been in England. It was stated that it was his intention to visit Cobalt before returning to British Columbia.

Mr. F. Chas. Merry continues to have charge of the Silver Sup and Nettie L. groups of mines, in Trout Lake mining division, Lardeau district of British Columbia. Shpment of silver-lead ore from the former group has been maintained for a number of years, while during recent months some ore has also been sent out from the latter, after several years of inactivity and consequent non-production.

Mr. James Price, who after having worked thirty-seven years in the coal mines at Nanaimo—thirty-three years as a fire boss—has decided to "get back to the land" and spend his well-earned retirement on his "ranch," near Nanaimo, was last month the recipient of a valuable gold watch, presented to him by his fellow miners and the officials of the Western Fuel Company.

Mr. Thos. T. Read, of San Francisco, California, associate editor of Mining and Scientific Press, has been visiting several parts of Arizona.

Mr. Hallett R. Robbins, who several years ago was in charge of development work at a mining property, Hedley camp, Similkameen, B.C., and recently of Atlantic, Wyoming, has been appointed assistant professor in the Department of Mining Engineering and School of Mines, State College of Washington, Pullman, Washington, in place of the late Mr. Roswell E. Sampson, who was run over and killed by a railway train last winter.

Mr. Bruce White has returned to Nelson, B.C., from a visit to Boston and the State of Maine.

Hon. Dr. H. E. Young, provincial secretary in the McBride Government, British Columbia, has gone north to personally investigate the situation in connection with recent reports of new finds of placer-gold on creeks flowing into Teslin Lake, mention of which was made in the Canadian Mining Journal on January 15th last, page 48, and in connection with which there has lately been a little excitement at Atlin and other northern settlements.

Mr. W. Fleet Robertson, Provincial Mineralogist of British Columbia, who, during his stay in the East, has been conferring with the Executive Comimttee of the International Geological Congress with regard to the

British Columbia excursion arrangements, leaves for Victoria towards the end of March.

Mr. A. W. Allen, secretary of the Lucky Jim Zinc Mines, Limited, is now resident in Victoria, B.C., the company's office having been removed to that city from Kaslo, Kootenay Lake. Now that the interruption to railway traffic by frequent snow slides has ceased, shipment of zinc ore from the Lucky Jim mine, Slocan District, to the United States has been resumed by the company.

Mr. J. W. Boyle, of Dawson, Yukon Territory, was in London, England, in February. Another Yukon visitor to that country was Mr. A. N. C. Treadgold, also of Dawson, managing director of the Granville Mining Company.

Mr. E. E. Campbell, one of the Granby Consolidated M. S. and P. Company's mining engineers, is in Hazelton district, Skeena River country, British Columbia, obtaining information relative to prospective ore output, etc.

Mr. Norman Carmichael, formerly manager of the Duncan United Mines, in West Kootenay, B.C., and now general manager for the Arizona Copper Company, Limited, was at Globe, Arizona, recently. Mr. John Kiddie, elder son of Mr. Thos. Kiddie, the well-known metallurgist of British Columbia, now holds a prominent and responsible position under Mr. Carmichael and has his headquarters at Morenci.

Mr. Hayman H. Claudet, representative in British Columbia of the owners of the Elmore Vacuum process, small plants of which he has from time to time installed and operated in that province, recently left Rossland on a trip to Europe.

Mr. John F. Coats, of Spokane, Washington, who some time since had charge of development work at a coal property on Tulameen river, a few miles above Princeton, Similkameen, B.C., was one of the members of the Canadian Mining Institute who attended the meeting of the Western Branch held in Nanaimo, Vancouver Island, on March 4th and 5th.

Mr. Alex. Faulds, of Vancouver, B.C., was in Los Angeles, California, a short time ago.

Prof. T. S. McCaffery, of Moscow, Idaho, professor of mining engineering, University of Idaho, in his capacity of chairman of the Spokane Local Section of the American Institute of Mining Engineers, is interesting himself in promoting the success of the joint meeting of the section with the Western Branch of the Canadian Mining Institute, to be held at Rossland, B.C., in May, proximo.

Mr. J. W. D. Moodie, of Britannia Beach, Howe sound, B.C., vice-president and general manager of the Britannia Mining and Smelting Co., is busily engaged in pushing forward the work of extensive further development and equipment of the company's copper-mining property on Britannia mountain, and concentrating plant at Britannia Beach.

Mr. W. G. Norrie, of Bear lake, Slocan, B.C., superintendent for the Lucky Jim Zinc Mines, Ltd., after a particularly hard winter's experience, owing to the frequent recurrence of snowslides, has at length succeeded in re-establishing railway communication, so that the shipment of zinc ore from the Lucky Jim mine to the United States has been resumed.

Mr. M. E. Purcell, superintendent of the Consolidated Mining and Smelting Company of Canada's Centre Star-War Eagle group of mines, returned to Rossland, B.C., on March 31. After having attended the annual meeting of the Canadian Mining Institute at Ottawa on March 5-7, as representative of the Western Branch, of which he is chairman, Mr. Purcell went to Montreal, New York, and Washington, and thence back to Canada via Buffalo and Niagara Falls. After a short stay in Toronto he returned to British Columbia.

Mr. A. E. Rand, of New Westminster, B.C., has been visiting Los Angeles, where he met Mr. Thomas Kiddie, metallurgist, formerly of Vancouver, B.C. Mr. Rand is largely interested in mining properties in Nelson mining division, including a large group of claims within a few miles of the town of Nelson, and the Dundee property in Ymir camp.

Mr. Thomas Russel, for about 20 years actively connected with the management of coal mines on Vancouver island, and who last year resigned as manager of the Extension colliery of the Canadian Collieries (Dunsmuir), Limited, is now practising as a consulting coal mining engineer, with headquarters in Vancouver, B.C.

Mr. Sam Silverman, now of Spokane, Washington, who in the nineties was interested in mining properties in Kootenay district of British Columbia, and later operated a copper mne on Prince of Wales island, Alaska, recently accompanied Mr. James Cronin, manager of the Standard silver-lead mine, to that property, which is situated near Silverton, Slocan lake, B.C. The party also included two visitors from Salt Lake City, Utah.

Mr. Alex. Smith, of New Denver, Slocan lake, B.C., manager and one of the owners of the Surprise silver-lead mine, on the divide between Cody and McGuigan basin, Slocan, has been spending the latter part of the winter in Vancouver. After several years' persistent development work, the Surprise is now sufficiently opened to commence the shipment of ore to the smeltery as soon as it shall be practicable to haul heavy loads to the railway at Sandon.

Mr. O. B. Smith, Jun., general mining superintendent for the Granby Consolidated Mining, Smelting and Power Co., has returned to Vancouver, B.C., from a trip to Boston, New York and other eastern cities. With him on his journey westward was Mr. R. P. Williams, western representative of the Ingersoll-Rand Co., who had also been on an eastern trip.

Mr. Wm. Fleet Robertson, of Victoria, provincial mineralogist for British Columbia, has returned to his headquarters in the capital of the province, after having attended the meetings, in Ottawa, of the International Geological Congress Organization Committee and the Canadian Mining Institute. Before returning West he also visited New York City.

Prof. Francis A. Thomson, of Pullman, Washington, head of the Department of Mining Engineering of the State College of Washington, spent the Easter vacation at Victoria, B.C.

Mr. G. B. Webster, who a short time ago returned to New Denver, B.C., from a visit to eastern Canada, has commenced to work, under lease and option of purchase, the Neepawa silver mine, in the "dry belt," Slocan City mining division.

Mr. W. E. Zwicky, of Kaslo, B.C., general manager of the Rambler-Cariboo Mines, Ltd., in McGuigan basin, Slocan, has put men back to work in the low-level tunnel being driven to open the Bayne mine at considerablely greater depth than its old workings reached. For a time work had to be suspended on account of there being too strong a flow of water to allow of driving being continued at reasonable cost.

Mr. G. J. MacKay, a graduate of the School of Mining, Kingston, who, in 1910, was nominated by the Canadian Mining Institute for a post-graduate course provided by the Institution of Mining and Metallurgy, has just been appointed to an important position as metallurgist for the Machavie Gold Mining Co., at Potchefstroom, Transvaal. Previous to this appointment he was assistant metallurgist at the Angelo Deep.

# SPECIAL CORRESPONDENCE

## NOVA SCOTIA.

At the next annual meeting of the Nova Scotia Mining Society a proposal will be brought up to move the headquarters of the society to Sydney, and no doubt an animated discussion will take place. There is, however, a great deal to be said in favour of that, with the single exception of coal, the mineral production of appreciable output of tungsten ore, and a little barytes, but the gold mined is the lowest for many years, and iron ore seems to have disappeared altogether. Coal shows a good increase, but, practically, the entire increase comes from Cape Breton, and from the Sydney coal field at that. The two large companies of the Sydney coal field, namely, the Nova Scotia Steel and Coal Co., and the Dominion Coal Company, mined 84 per cent. of the provincial output, and contributed the not inconsiderable quantity of 40 per cent. of the entire output of Canada. Correspondingly, the major portion of the revenue of Nova Scotia, came from the coal royalties earned in the neighbourhood of Sydney. For these and many other reasons the persons who urge the removal of the Nova Scotia Mining Society's headquarters to Sydney consider that it would be a more suitable place for the consideration of mining problems than Halifax.

Sydney and the vicinity is very poorly provided with educational facilities. It is now too late to urge that the Nova Scotia Technical College would have been better placed in Sydney than in Halifax, but it is an undoubted fact, so far as the engineering branches of technical training are concerned. The mining schools and other educational opportunities afforded to those who have left the elementary schools and commenced work are doing and have done extremely good work, but it is quite impossible to furnish these schools with the elaborate equipment of philosophical apparatus that is necessary for the adequate demonstration of such phenomena as that connected with mine gases, for example. The presence of a properly fitted technical college, primarily intended for day students, would make it possible to use the same equipment for evening schools, and such an institution at Sydney would make an admirable centre for the workers of Sydney mines and Glace Bay, in addition to the students from Sydney itself. Instruction at the ordinary mining school, supplemented as it so often is by correspondence courses, and by actual work during the day, has produced the great majority of the men in charge of the technical operations of the mines and steel works of Cape Breton, but education obtained in this way requires years of hard grinding, and imposes cruel limitations on hard-working men. It is one thing to read about certain phenomena actually demonstrated before one's eyes, and it adds a variety and a zest to study that is very welcome after the steady plodding that pure reading

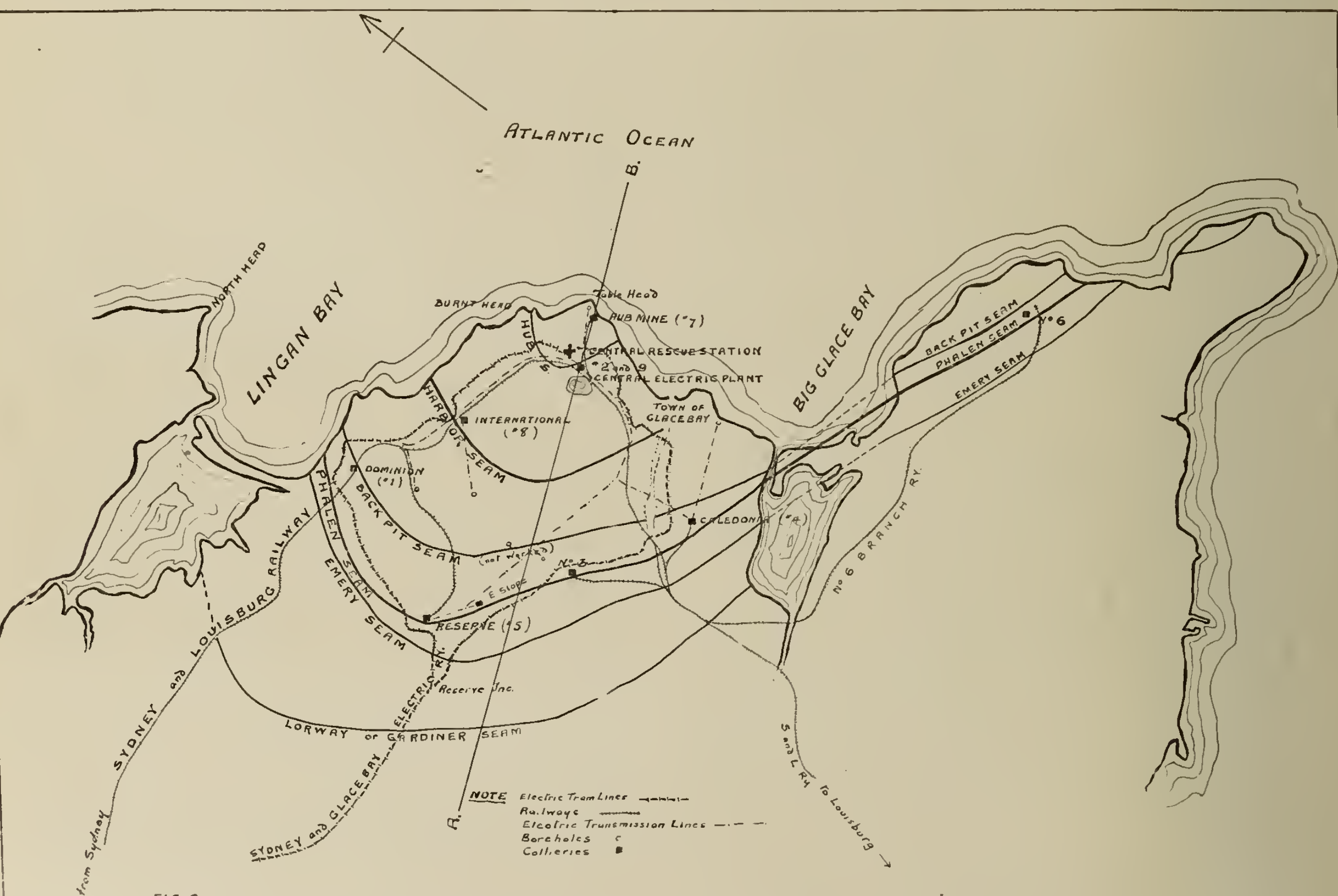



FIG. 2

— PLAN OF THE GLACE BAY BASIN —

Showing Coal Crops and the Mines and Railways of the Dominion Coal Co.

involves. The man who hears the ascending and descending scale of detonations caused by graded admixtures of "gas" and air, and who watches the effect of a handful of coal-dust in an explosive mixture of gas and air, has a much more vivid and permanent knowledge than if he can only learn from books, or the words of a lecturer.

Some time ago the Technical Education Commission visited Cape Breton, and the result of their labours is anxiously awaited. It is quite certain that the members of this commission did not visit a coal and steel centre in Europe of similar importance to Sydney that did not have a properly equipped technical school within reach of the workers. And if rumor is true there are towns in the Canadian West with far less natural wealth than Sydney, where the value of technical education is appreciated. The question of technical education in Nova Scotia has been put to a political use, but indeed it would be difficult to name anything in Nova Scotia that has not. The present presentation of the case has, however, not the remotest connection with party use of the question, but is a claim that a population of between 40,000 and 50,000 persons dependent on coal-mining and steel-making should have access to a technical school or college properly and adequately provided with the needful apparatus.

**Port Hood Mine.—Inverness Co.**—The report of the Inspector of Mines for Nova Scotia and the "Appraisers as to Cause of Accident, etc.," on the flooding of the Port Hood Colliery, has been laid before the Nova Scotia Legislature. The opinion of these gentlemen as to the cause of the accident is given as follows:—

"Our conclusion is that the mine is flooded by the water of the ocean, and we are more inclined to believe that it was through a fissure in the rock more nearly vertical in direction, than that the water followed the strata a long distance finally making its appearance in the mine at the point above described.

"We recommend that it is not advisable to undertake the unwatering of the Port Hood Mine for some time to come, for the reason that the connection with the sea as far as can be ascertained is not closed, and that the water having risen as high in the mine as it is likely to, the conditions against the fissure closing are in a great measure removed."

The report as issued is but preliminary, and does not contain certain data referred to, nor the evidence given before the commission. This wall no doubt be issued to the public at a later date. The report also contains a reference to the flooded mine at Mabou. Comment on this matter would be out of place until the complete report, with the evidence, is published.

## ONTARIO

**Porcupine and Swastika.—The Strike Aftermath.**—Of the first importance to the mining industry are the decisions rendered by Judge Kehoe on appeal from the convictions of Magistrate Torrance, under the Lemieux Act. It will be remembered that the Hollinger Mines induced the Crown to take action against 302 of their men for going out on strike without notice, and also to prosecute William Holowaska, Peter Cleary and Croft for inciting. Holowaska and Cleary were each fined $500 each and cost or three months in jail. Croft was fined $50 or 60 days. All the men refused to pay fines, and went to jail. As the result of the application of their counsel to the Minister of Labour and the Minister of Justice the three men were paroled and released under the ticket of leave act after they had served twenty days of their sentences. Appeals were then made and all three cases were retired before Judge Kehoe in Porcupine on March 26th. As a result he reversed Magistrate Torrance's decision in the cases of Holowaska and Croft and confirms it in the case of Cleary.

The following is Judge Kehoe's decision in full:—

Rex vs. William Holowaska.

A. G. Slaght for appellant,

T. C. Robinette, K.C., and Mr. John Godfery, for respondent.

"This is an appeal from the conviction made by Mr. Thomas Torrance, Police Magistrate, on the 21st January, 1913, under which the defendant was convicted under section 60 of the Industrial Dispute Investigation Act, 1907, and being chapter 20 of 6-7 Edward VII., for inciting to strike contrary to the provision of the Act. By this is meant, according to section 56, a strike which is unlawful by reason of an employe going on strike "on account of any dispute prior to or during a reference of such dispute to a Board of Conciliation and Investigation under the provisions of this Act." There is a lengthy clause, section 2, sub-sec. (c) which defines the meaning of the word "dispute," the effect of which is that it means "any dispute of difference between an employer and one or more of his employes" as to certain things therein generally stated, or as to any other things therein, specifically mentioned, such as wages, hours of employment, material supplied and alleged to be bad, unfit or unsuitable, established customs or usage, interpretation of agreement, and other matter.

Dumps at Savage Mine. Enough to run ten stamps at McKinley Mill for three years

"It was not proved before me, nor was it necessary to prove that there was any reference to a Board of Conciliation or that there was any request for the same.

"The evidence shows that the first sign of dispute was the strike itself, or rather the inciting by the defendant of the strikers. The strike followed this inciting. As the prosecutor stated, the strike came to him with so much surprise that it was like a thunderclap. It appears that there was no demand for increased wages, shorter hours of labour or anything of any kind until the defendant called upon the men to strike. This call was the very beginning of the dispute. There cannot be a dispute or difference unless there are two parties who dispute or differ with one another. It may be, and without doubt must have been the case here, that the strike was pre-concerted among the men, though there is no evidence that this is so. But stating it as strongly for the prosecution as possible, and allowing that the strike was the result of a previous understanding between the men, still matters did not reach a stage where there was a demand by the men for better terms and a refusal by the employer, the Hollinger Mines Company, of what the men asked. When such a demand and a refusal were not made, can it be said that there was any dispute until the strike itself created the dispute? If the answer be that there was no dispute until the strike itself then will come the necessity of answering another question. Did the men go on strike "on account of any dispute," to quote the words of section 56?

"In my opinion the defendant is not brought within the Act as an offender under sections 56 and 61 for the reason that the strike was not on account of any dispute. To hold otherwise would be to eliminate the words "on account of any dispute" from section 56. If these five words were not in the section, then it would be clear that the defendant by his inciting was guilty of an offense.

"The Act when framed might have been so framed with or without these words. One cannot assume that they were placed in the section without it being intended that they were to have a meaning and, perhaps, were intended for a purpose. Possibly it was considered that when a strike comes like a bolt out of the blue instead of like a storm of which there is premonition there is not the danger to the peace of the community that would be engendered by the antecedent mutterings.

"Another consideration is that penal statutas must receive a strict construction.

"The conviction is quashed with costs to be paid by the prosecutor to the defendant, which costs I fix at $50."

Rex vs. Croft:—

"The same decision was reached in this case as in the case of Holowaska."

Rex vs. Peter Cleary:—

"There is a difference in the circumstances of this case from those in the Holowaska case; the inciting was done after the strike had started. I confirm the conviction. The costs of the appeal, which I fix at $50, are to be paid by the defendant to the prosecutor."

**Kirkland Lake.**—There is no doubt of the growing of the Kirkland Lake section of the Swastika Camp. The Tough claims occupy the centre of the stage and the narrow but very rich ore body has now been proven to a depth of 70 feet. It is stated to be the intention of the management to sink right at once to the 200-foot level. Another carload of ore will be shipped before this is in print, after which it will be crushed in the little five stamp mill, which has already reached the property, but which has not been set up yet. Among reliable engineers there is now much optimism expressed of the future of the camp. While the ore bodies are not large they are well defined and easy to follow, thus obviating the heavy development costs of Porcupine, where the veins are much faulted and the most careful exploitation work is necessary. The Foster Tough has of course more than paid its way from the very start. The Hughes claim, which has now been taken over by the Great Northern Mines, is regarded as being second in importance in the new district. It is on the southwest shore of Kirkland Lake, and, unlike the Foster, is entirely in the porphyry. The high-grade streak is no more than eight inches wide, and, while being rich, it is not as rich as the Foster. The Crown Reserve Mining Company had an option on this property at a big figure with quick payments. On that basis they turned it down. The Great Northern obtained it on much easier terms. The vein has been traced and stripped in places for 300 feet. Recently an engineer took channel samples for two and a half feet on either side of the vein for a distance of 150 feet. and the results showed good milling ore for the entire width of five feet. A small plant will be installed and work proceed on an economical scale.

For the mining of these small, high-grade veins it has been demonstrated that the equipment needed is inexpensive and the initial outlay inconsiderable. Though they may not enjoy long life, returns from some of them will certainly be quicker than the average quartz gold mine.

So far, mining has proceeded along workmanlike lines, and little has been spent on frills. The Government is going to build a good road from Swastika to the Kirkland Lake, so that it is most unlikely that the settlement will be split up into two or three sections, as at Porcupine.

**Swastika.**—The Swastika mill is now running and paying current expenses. The slime table has not yet been installed, and not a very high recovery is being made. as so far only one sand table is being used. About twenty tons a day are being treated, the ore coming from the 100-foot level. Development is proceeding both ways on the 300-foot level, and occasional patches of ore of good grade are discovered.

A Buffalo syndicate has taken a working option on the Foley-O'Brien. The shaft has been pumped out, and it is understood that the mine will be running again shortly.

The new mill at the McIntyre mine is now running to capacity. One hundred and fifty tons are being treated daily and the management states its satisfaction with the extraction obtained.

At the McEaeneny mine an order has already been given for five more stamps.

Results have already been obtained by the diamond drilling on the Schumacher syndicate. At a vertical depth of 400 and 800 feet two gold ore bodies from which gold is visible in the cores have been cut. Up to March 28th no less than a thousand feet of drilling had been done within the month, and the contract, which called for 1,050 feet, was completed in March.

It is now announced that the shaft at the Pearl Lake will be put down to the thousand-foot level without delay. It is now seventy feet belowe the 600-foot. No official statement has as yet been made as to values.

**Cobalt, South Lorrain and Gowganda.**—The draining of both Kerr and Cobalt lakes will undoubtedly be proceeded with once the mining companies principally concerned are allowed to do so.

Last spring an amendment was inserted in the Ontario mining law giving mining companies the power to drain lakes "where required for the proper working of a mine" after the Mining Commissioner had heard the parties interested and given his permission. The section under which it was proposed to act reads: "The lake, pond, river or stream or watercourse, or any of the water, notwithstanding that the same or part othe water, notwithstanding that the same of part thereof may be on the lands of or owned by any other person or that any other person may have rights or interests in or to such water or the use thereof."

By such draining of Kerr Lake, a good many million ounces of silver could be mined on the properties of the Kerr Lake and the Crown Reserve which is now held intact and, in addition, it would give opportunity for the freer prosecuting of considerable valuable territory not now accessible. Some time before the case should have come before the Mining Commissioner action was taken in the courts to prevent any further progress.

At Cobalt Lake, which it is also proposed to drain, it is known that considerable bodies of high-grade ore could be mined if the water could be pumped out. This would affect not only the Cobalt Lake property, but in a minor degree the McKinley-Darragh and the Right of Way.

**Peace at the Beaver.**—The strike of seventy miners at the Beaver mine has been satisfactorily settled. The cause of the dispute was the dismissal of one of the men to which the miners objected. They stated they would walk out unless he was reinstated and, upon the management refusing to do this, they left work. The mine was closed down for nine days and the mill eight. During that time the management made no attempt to fill the places of the old employes, but at the end of a week issued a manifesto to the effect that unless the men returned to work by April 3rd they would be compelled to conclude that they did not want to come back and they would fill their places. A meeting of the union was held, and it was decided to return to work, and the mine and mill are now running again.

**Lawson Prospers.**—The Lawson of the La Rose Consolidated is now getting some very high-grade ore on the 88-foot level of the No. 8 vein. When struck it appeared to be but a branch of the main vein, but it has now developed into a very rich ore body, which will raise the production from the Lawson to considerably above its normal level for the first quarter of the year.

**Eight-Hour Bill.**—The eight-hour bill for underground miners has naturally aroused considerable discussion in the camp. A deputation from the Cobalt Board of Trade waited upon the Hon. W. H. Hearst, Minister of Lands, Forests and Mines, and explained some clauses in the bill which appeared to them to be ambiguous and to be likely to cause considerable trouble in the future. The Hon. W. H. Hearst promised that their recommendations should be taken into consideration when the bill was read a second time.

**Montreal River and Lorrain.**—There is promise of further activity, both in the Montreal river district and South Lorrain this year. In South Lorrain the Pittsburg-Lorrain Silver Mining Company, which is working the Currie, have their shaft down to the 300-foot level, and are running their own plant. It is understood that there is also a prospect of a company taking over the Trout Lake Mining Company, the Beaver Lake and some other good prospects, and developing them, this summer. At Gowganda the Mann has just shipped its second carload of high-grade. At Elk Lake the completion of the railroad has enabled a number of shareholders who have seen the mines they were interested in to take a look at their properties, and there have been some private cars on the sidings during the past two weeks.

## BRITISH COLUMBIA

Information concerning reported finds of placer-gold on creeks south of Teslin lake, in Atlin mining division, Northern British Columbia, has been attracting some attention, though as yet particulars are meagre. Most published accounts lack definite details as to whether or not gold has been obtained in any quantity above a few dollars' worth, but one press despatch from Skagway, Alaska, dated March 22, stated that one man had arrived in Atlin "with several thousand dollars' worth of washed gold, the first brought out from the scene of the new strike." A communication from Mr. W. Scott Simpson, Indian agent in the Stikine River district, which lies south of Atlin mining division, dated March 2 and addressed to Mr. A. M. Tyson, inspector of Indian agencies for Northern British Columbia, has been published. It is to the effect that at present there are but few of the older Indians on the reserve at Tahitan village, the majority of the men being now in the vicinity of Silver creek, a tributary of Teslin river, which joins that river about 35 miles south of Teslin lake, into which latter the river flows. Mr. Simpson reports that on February 5 a deputation of Indians waited on him and produced a letter which had been sent to them by Atlin Indians, stating that they had found new placer diggings on Silver creek. The Indians requested him to accompany them on a claim-staking expedition and to see that their record papers and lay-over permits were properly made out. Thinking it might lead to the ultimate prosperity of the Indians, he accompanied the party, which on February 7, left Telegraph creek, a settlement on Stikine river, and on March 2 returned to that place, after turned from a visit to Atlin, after having made many enquiries, has concluded that the best way will be for the Government to open a trail from O'Donnell river, in Atlin camp (on which river new placer-gold finds were made late last autumn), to the new diggings, which, he is informed, can be reached in 90 miles from Atlin. He sent in a party of men by the longer old trail, and instructed them to return by the proposed shorter route to Atlin via O'Donnell river. On receipt of their report he will, if it be favorable, recommend the Government to at once proceed to open the proposed new trail. Meanwhile, it will be well for those who shall think of going to the reported new placer diggings to await publication of authentic information from known reliable sources, for there is likely to be the customary exaggeration on the part of those interested chiefly in inducing men to spend money in travelling and outfitting, regardless of whether or not there shall be a fair prospect of the reported new diggings poving sufficiently productive to warrant the outlay necessary to reach the locality.

**Britannia Mining and Smelting Co.**—The Britannia Mining and Smelting Co., operating a copper mine on having staked claims on three creeks. The Atlin Indians produced an ounce and a half of gold they had obtained there last fall. The Atlin Indians had obtained free miners' certificates and staked claims last November on the best-looking parts of the creeks. Various Indian tribes have staked claims to an estimated number of about 300, and white men have about as many. Under existing conditions of snow and frozen ground, it is difficult to say whether or not the new diggings will prove payable to any considerable number of miners; it is probable many of the claims will prove hard to work. Three routes to the new field have been mentioned in newspaper notices. One is via Whitehorse (in Southern Yukon Territory) up the Hootalinqua river to Teslin lake, and then down the lake to its southern end, which is about 35 miles from the locality of the new find. Another is via Skagway to Carcross (Caribou Crossing) by railway, thence to Atlin and from that camp by trail east to the creeks under notice. The third is by Wrangel, in Southeastern Alaska, and Stikine river to Telegraph Creek, and thence by trail. Hon. Dr. H. E. Young, provincial secretary in the Government of British Columbia, who, late in March, re- Britannia mountain, Howe sound, within 30 miles by water of Vancouver City, does not appear to be finding any serious difficulty in continuing its development mining, concentrating, and construction operations, for about Easter time it had approximately 600 men at work, all told, and operations were in progress in all of these several departments above-mentioned. Miners' Union officials have caused to be published in provincial newspapers statements to the effect that 700 men had struck work; as a matter of fact, less than half that number went out at the call of the Union, leaving rather more than half remaining at work. When the property was visited at Easter time by the writer of these notes, it was found that mining and extraction of ore were being carried on up at the mine, although the mine crew was 30 to 40 men short of the full number for which there is work; the long aerial tramway from the mine down to the concentrating mill at Britannia Beach was beings used for the conveyance of ore, some 500 tons of which was being sent over it daily; the work of driving the long, low-level adit—now in more than 3,600 feet, and with 1,400 feet more to be driven before the 1,200-foot raise to the 1,050-foot level of the mine workings above will be commenced—was being continued with two shifts of men; three-roomed houses for the accommodation of married men were being built near the portal of the tunnel, where the new central camp is being established, with a dozen houses already erected and ground cleared for more; large new bunk and boarding houses at this camp were occupied, and power house and machine shop were being equipped with much machinery and plant; grading for the railway from the tunnel to the top of a long incline to be made for transportation between tunnel and mill was well advanced; construction of new power house at Britannia Beach was nearly completed, and the erection of the building for the Minerals Separation process plant was well forward; erection of new houses for married employes was being vigorously proceeded with; a large new store-basement, ground-floor, and three storeys, was about finished; dock, bunker and other shipping facilities were being added to; railway connections from mill to shipping docks were being improved; concentration mill was treating 500 tons of ore daily and provision was being made for an increase to 600 tons, and, generally operations were being carried on with comparatively little inconvenience, and with good prospects of shortly having full working forces in all departments, for every day a few more men were arriving as it became generally known that the Miners' Union's efforts to prevent a continuance of operations had proved quite ineffectual. The company has stated most positively it will not recognize the Union, but will do in the future, as it has done in the past, pay good workmen the best wages obtainable at similar work elsewhere on the Coast; will give them good food and accommodation, with all reasonable provision for their health, comfort and recreation, and will provide permanent employment for all its employes so long as they shall do a fair day's work for their pay and otherwise conform to the rules under which they accept employment here.

**Want Report Suppressed.**—The Nelson Board of Trade, at a meeting of about 20 of its members, not one of these being a mining engineer or metallurgist, recently appointed a committee of three "to act with the secretary in writing to the Minister of Mines calling attention to the damage being done to the mining industry of Nelson district by such statements as have recently appeared." The statements referred to were included in a published report of the Provincial Mineralogist, a man quite disinterested, of unquestioned integrity and, withal, a metallurgist of considerable operating experience. The report gave the results of that official's investigations in connection with A. Gordon French's claims to have discovered metals of the platinum group in ores and dike matter occurring within a few miles of Nelson, identical sets of samples of which had been sent to eight chemists for determination and reported on by seven as not containing even a trace of the platinum metals. No mine manager was present at the meeting, and the chairman, who most strongly denounced the Provincial Mineralogist, is an ex-grocer, now a "mining broker" and real estate agent. The committee of three consists of a lawyer, a mechanical engineer and a jeweller. Several mine managers have intimated to the Provincial Department that they entirely disapprove of the action in this connection of the Nelson Board of Trade.

**Dividends from Metal Mining Companies.**—The total amount of dividends paid by metalliferous mining companies operating in British Columbia, of which public announcement has been made, during the quarter ended March 31, is $523,734. Four companies contributed to this total, in the following proportions: British Columbia Copper Co., $88,756; Granby Consolidated M. S. and P. Co., $224,978; Hedley Gold Mining Co., $60,-000, and Standard Silver-Lead Mining Co., $150,000. The last-mentioned company, which owns and operated the Standard mine and concentarating mill, near Silverton, Slocan lake, has paid $575,000 in twelve months, having made its first dividend distribution, of $25,000, in April, 1912, and since then a monthly distribution of $50,000.

# COMPANY NOTES

## KERR LAKE DIVIDEND.

The Kerr Lake has declared a quarterly dividend of 25 cents a share, payable on June 16th.

## INTERNATIONAL COAL.

Profits of International Coal and Coke Company for 1912 were $232,198, compared with $56,073.38 in 1911, during which latter period, however, the mines were closed for nearly eight months on account of the general mining strike in Southern Alberta.

## LA ROSE PROFITS IN MARCH.

La Rose's March production of silver was 239,934 ounces to a value of $128,733, which, with sundry income of $3,253, brings that for the month up to $131,-986.

Marketing expenses, concentration and other charges amounted to $57,882, leaving the profit for March $74,-104.

The cash statement to March 31st is as follows:

| | |
|---|---|
| Cash surplus | $1,473,509 |
| Outstanding shipments and ore at mine ready for shipment | 293,302 |
| Total | $1,765,811 |

Prof. E. Dulieux, of L'Ecole Polytechnique, Montreal, leaves on May 4th to serve a month with the French army, in which he holds the rank of lieutenant.

PROVINCE OF BRITISH COLUMBIA

## GRANBY RETURNS.

During the last ten days of March the Granby smelter treated 34,525 tons of ore from the company's own properties at Phoenix, as well as 460 tons of customs ore, making a total treatment for the period of 35,005 tons. During the ten days the blister copper shipments were 717,000 lbs., giving a total for the month of March of 2,020,000 lbs.

For the first three months of the current year the smelter has treated 305,783 tons of ore from its own mines, and 3,094 tons of custom ores, or a total treatment of 308,077 tons. The blister copper shipments for the same period aggregated 5,588,245 lbs. The figures for the three months are as follows:

Granby ore treated: January, 100,881 tons; February, 96,971 tons; March, 107,931 tons.

Foreign ores treated: January, 1,268 tons; February, 886 tons; March, 107,931 tons.

Total ore treatment: January, 102,149 tons; February, 97,857 tons; March, 108,871 tons.

Copepr shipments: January, 1,828,245 lbs.; February, 1,740,000 lbs.; March, 2,020,000 lbs.

The recovery of 5,588,245 lbs. of copper from 308,077 tons of ore smelted would give the Granby practically 18 1-7 lbs. per ton for the first three months of the current year. On a 15 cent copper market the Granby should realize from copper recovery alone the sum of $837,969 from the first quarter of the year's operations. At the same rate of production for the remainder of 1913—and there is every reason to believe this will be maintained, if not increased, as the March shipments were 191,755 lbs. in excess of those of January, although the two months were of the same number of days, and February was a short month—the copper recovery for the year should be in the neighbourhood of 22,353,000 lbs., or $3,352,950.

## COBALT LAKE DIVIDEND AND BONUS.

A second dividend of 2½ per cent., with an additional half per cent. bonus attached, was declared by the Cobalt Lake Mining Company on April 1st. As was the case with the first dividend the declaration is for no specified period. It is made payable May 20th to shareholders of record May 17th. The distribution will amount to $90,000.

Those shareholders who have deposited their stock in accordance with the agreement made with the English syndicate will receive dividends on that portion of the stock which has not been taken up. The next option, which is on 15 per cent. of the stock at 66¾, expires April 15th, and the option after that on 5 per cent. of the stock at 73 expires May 15th, so by the time the dividend is payable 55 per cent. of the stock deposited will be owned abroad if the options are taken up.

## COBALT ORE SHIPMENTS FOR WEEK ENDING APRIL 12TH.

Cobalt, April 12.—In a production of 150,000 ounces for the first quarter of 1913 the Trethewey mine shows a falling off, due to the fact that during one week in February the mill was closed down on account of repairs.

During the month of March the production ran upwards of 60,000 ounces of silver, and at present all the production of the mine is coming from the mill.

The ore shipments from the Cobalt camp last week include a car of high-grade ore from the Casey Cobalt and one from the Penn. Canadian. The Nipissing, despite its two hundred tons per day of low-grade through the new mill, is still shipping a little crude ore to the smelters.

The shipments for the past week in pounds are:

| | High | Low | Pounds |
|---|---|---|---|
| Casey Cobalt | 1 | . | 40,500 |
| Cobalt Lake | 1 | . | 65,200 |
| Crown Reserve | 1 | . | 42,700 |
| Nipissing | . | 1 | 60,900 |
| Penn. Canadian | 1 | . | 64,124 |
| McKinley-Darragh | 1 | . | 75,691 |
| Silver Bar | . | 1 | 40,000 |
| | 5 | 2 | 389,115 |

Three mines shipped bullion from Cobalt this week for the London, England, market. In all they sent out 172 bars valued at $116,001.12.

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 87 | 105,866.30 | $62,461.12 |
| Buffalo | 57 | 57,588.70 | 34,000.00 |
| Crown Reserve | 28 | 33,700.00 | 19,540.00 |
| | 172 | 197,154.00 | $116,001.12 |

## SCOTIA'S MARCH OUTPUT.

The March output of Nova Scotia Steel & Coal Company was as follows: Coal mined, 64,000 tons; ore mined, 52,625 tons; pig iron made, 7,200 tons; steel ingots made, 7,300 tons.

## TORONTO MARKETS.

April 12th, 1913—(Quotations from Canada Metal Co., Toronto).

Spelter, 6.25 cents per pound.
Lead, 5 cents per pound.
Antimony, 10 cents per pound.
Tin, 52 cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 11 to 15 cents per pound.

April 12th—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.50 to $21.00 (f.o.b. Toronto).
Midland No. 2, $20.50 to $21.50 (f.o.b. Toronto).

## GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75 per ton.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

### Coke.

Connellsville Coke (f.o.b. ovens)—
Furnace coke, prompt, $2.25 per ton.
Foundry coke, $3.00 to $3.50 per ton.
Tin, Straits, 48.50 cents.
Copper, Prime Lake, 15.45 to 15.55 cents.
Electrolytic copper, 15.35 to 15.45 cents.
Copper wire, 16.25 to 16.50 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.85 to 5.95 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 9.00 cents.
Aluminium, 26.87½ to 27.12½ cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $2.00 to $2.25 per lb.
Quicksilver, $39.00 per 75-lb. flask.

## SILVER PRICES.

| | | New York Cents. | London. Pence. |
|---|---|---|---|
| March | 21 | 56⅞ | .... |
| " | 22 | 56¾ | 26⅛ |
| " | 24 | 56¾ | .... |
| " | 25 | 56⅝ | 26 1/16 |
| " | 26 | 57 | 26¼ |
| " | 27 | 57¼ | 26⅜ |
| " | 28 | 57¾ | 26 9/16 |
| " | 29 | 58¼ | 26 13/16 |
| " | 31 | 57⅝ | 26½ |
| April | 1 | 57⅝ | 26½ |
| " | 2 | 57⅜ | 26 7/16 |
| " | 3 | 58⅛ | 26¾ |
| " | 4 | 58 | 26 11/16 |
| " | 5 | 58¼ | 26 13/16 |
| " | 7 | 59 | 27 3/16 |
| " | 8 | 59 | 27 3/16 |
| " | 9 | 59 | 27 3/16 |

We regret to learn that Mr. W. Dixon Craig, who for so many years has been a member of the technical staff of Messrs. Drummond, McCall & Co., is about to abandon the profession of metallurgy to engage in the practice of law in the Province of Alberta.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

| | | | |
|---|---|---|---|
| **Dominion of Canada.** | Gwillim, J. C. | Tyrrell, J. B. | Obalski & Dulieux |
| **Ontario** | Hassan, A. A. | Willmott, A. B. | Ross, J. G. |
| Astley, J. W. | Haultain, H. E. T. | | Woolsey, W. J. |
| Cohen, G. W. | Hille, F. | **Quebec** | |
| Campbell & Deyell | Leckie, J. E. | Cohen, S. W. | **British Columbia** |
| Carter, W. E. H. | Loring, F. C. | DePencier, H. P. | Ashworth, James |
| Demorest, Stull & Low | McEvoy, Jas. | Hardman, J. E. | Fowler, S. S. |
| Evans, J. W. | Scott, O. N. | Hersey, Milton L. | |
| Ferrier, W. F. | Segsworth, Walter E. | Johnson, W. S. | **FOREIGN-New York** |
| Forbes, H. L. | Smith, Alex H. | Smith, W. H. | Hassan, A. A. |
| Graham, S. N. | | | |

## ASSAYERS, CHEMISTS AND ORE TESTERS.

| | | | |
|---|---|---|---|
| **Dominion of Canada** | Canadian Laboratories, Ltd. | Obalski & Dulieux | **Foreign-New York** |
| **Ontario** | | Dr. J. T. Donald | Ledoux & Co. |
| Campbell & Deyell | **Quebec** | | |
| Heys, Thos. & Son. | Hersey, Milton Co., Ltd | | |

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

**CANADA**

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.
1218. Summary Report of the Geological Survey for 1911.

**NEW BRUNSWICK and NOVA SCOTIA**

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.
1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

**QUEBEC**

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

**ONTARIO**

1213. Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

**NORTH WEST PROVINCES**

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

**BRITISH COLUMBIA**

1121. Memoir No. 13. Southern Vancouver Island, by Charles H. Clapp.
1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

**YUKON AND NORTH WEST TERRITORIES**

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.
1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

**CANADA**

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

**NOVA SCOTIA**

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

**NEW BRUNSWICK**

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

**QUEBEC**

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.
1184. May 38A. Danville Mining District, Quebec. Geology. Scale 1 mile to 1 inch.

**ONTARIO**

964. Geological map of portions of the districts of Algoma and Thunder Bay, Ontario. Scale 8 miles to 1 inch. Second edition.
1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.

**ALBERTA**

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

**BRITISH COLUMBIA**

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.
1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch.
1247. Map 69A. Route map of part of Nass River, British Columbia. Scale 8 miles to 1 inch.
1219. Map 54A. Nanaimo Coal Area, Vancouver Island, B.C. Scale 1½ miles to 1 inch. Contour interval 100 feet.

**YUKON and NORTH WEST TERRITORIES**

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

***Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.***

# BUYERS AND SELLERS OF METALS

## ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamators—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos Hayes & Son, 124 Yonge St. Toronto.
Canadian Laboratories, Ltd.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.

**Beams—Steel—**
Dominion Bridge Co. ... ...
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Belting—**
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.

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Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Boilers—**
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Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
John Inglis Co., Ltd.

**Buckets—**
Peacock Bros.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

**Building—Steel Frame—**
Dominion Bridge Co.
Canada Foundry Co.

**Cable — Aerial and Underground—**
Fraser & Chalmers, Ltd.

**Cableways—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

**Castings—**
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Crushers—**
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co., Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock, Ltd.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock, Ltd.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonian Iron Works, Ltd.

**Excavators—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.
**Girders—Steel—**
Dominion Bridge Co.
**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**High Speed Steel Twist Drills—**
Mussens, Limited.
**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jeckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.
**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
**Injectors—**
Mussens, Limited.
Peacock Bros.
**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. and Can., Ltd.
**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.
**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.
**Lights—Mine Bldg.—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
**Link Belt—**
Waterous Engine Works.
Jones & Glassco.
**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.
**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.
**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.
**Monel Metal—**
Orford Copper Co.
**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.
**Nickel—**
Can. Copper Co.
**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.
**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.
**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.
**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.
**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.
**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.
**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.
**Producer—Gas—**
Mussens, Limited.
E. Leonard & Sons.
**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
**Pumps—Electric—**
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**Pumps—Pneumatic—**
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.
**Pumps—Rotary—**
E. Leonard & Sons.
**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.
**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
**Pumps—Turbine—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**Pumps—Vacuum—**
E. Leonard & Sons.
Smart-Turner Machine Co.
**Quarrying Machinery—**
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
**Roasting Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
**Rolling Mill Machinery—**
Peacock Brothers.
**Rolls—Crushing—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Can. H. W. Johns-Manville Co.
**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos & Wm. Smith, Ltd.
**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.
**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.
**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.
**Separators—**
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.
**Separators—Magnetic—**
American Grondal Co.
Wetherill Magnetic Separating Co.
**Shovels—Steam—**
Mussens, Limited.
M. Beatty & Sons.
**Slime Tables—**
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.
**Smelting Machinery—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.
**Smelters & Refiners—**
Consolidated Mining & Smelting Co.
**Stamp Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Fraser & Chalmers, Ltd.
**Steel Drill—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Peacock Bros.
**Steel—Manganese—Castings—**
Peacock Bros.
Hadfield's Steel Foundry Co.
**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbank-Morse Co.
N. S. Steel & Coal Co.
**Steel—Structural—**
Dominion Bridge Co.
**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.
**Switchboards—**
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Co. of Can., Ltd.
**Tanks—Cyanide, Etc.—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.
John Inglis Co., Ltd.
**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
**Transformers—**
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Co. of Can., Ltd.
**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Son.
Peacock Bros.
**Tube Mills—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Fraser & Chalmers, Ltd.
**Turbines—**
Allis-Chalmers-Bullock.
Canada Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
**Water Wheels—**
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
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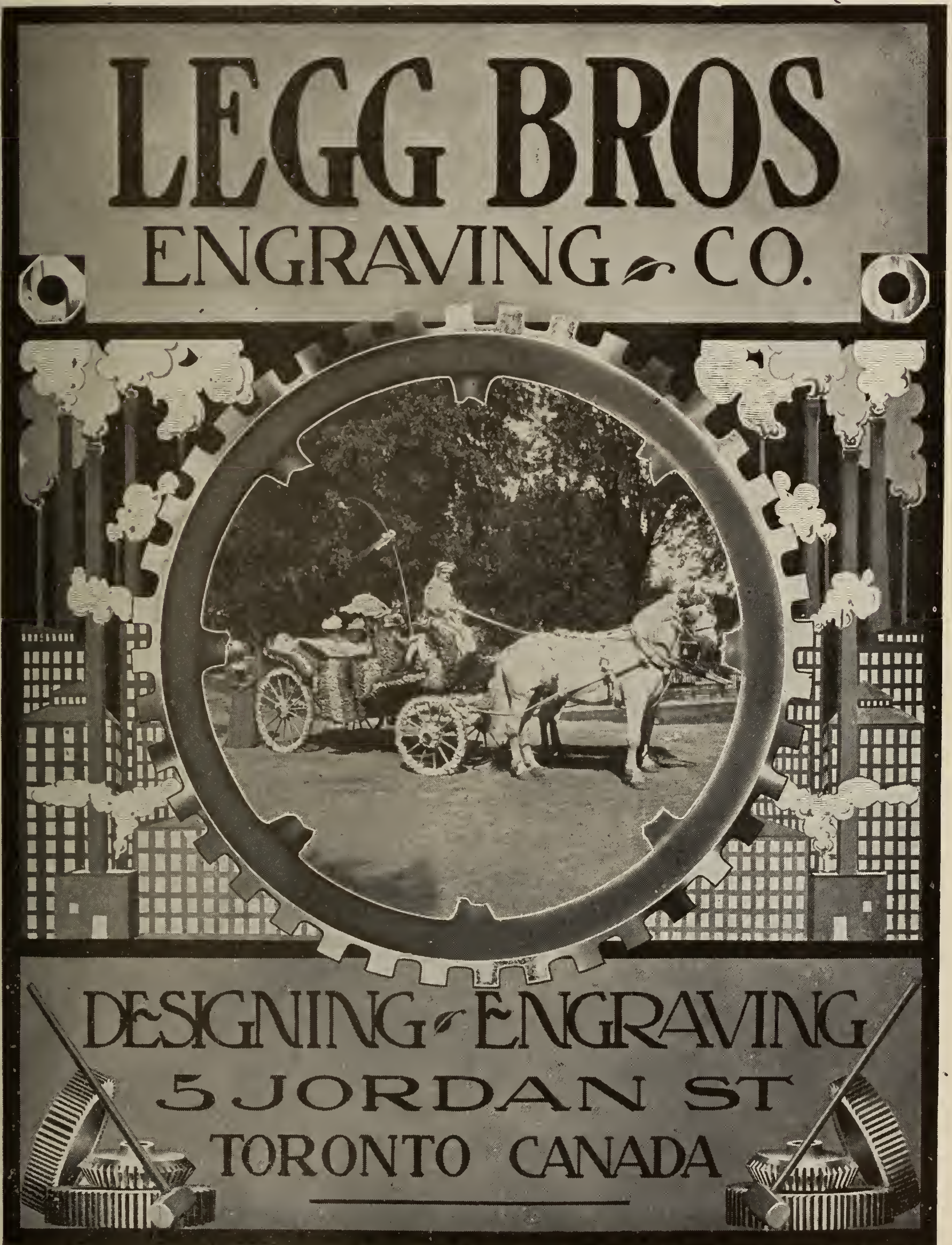
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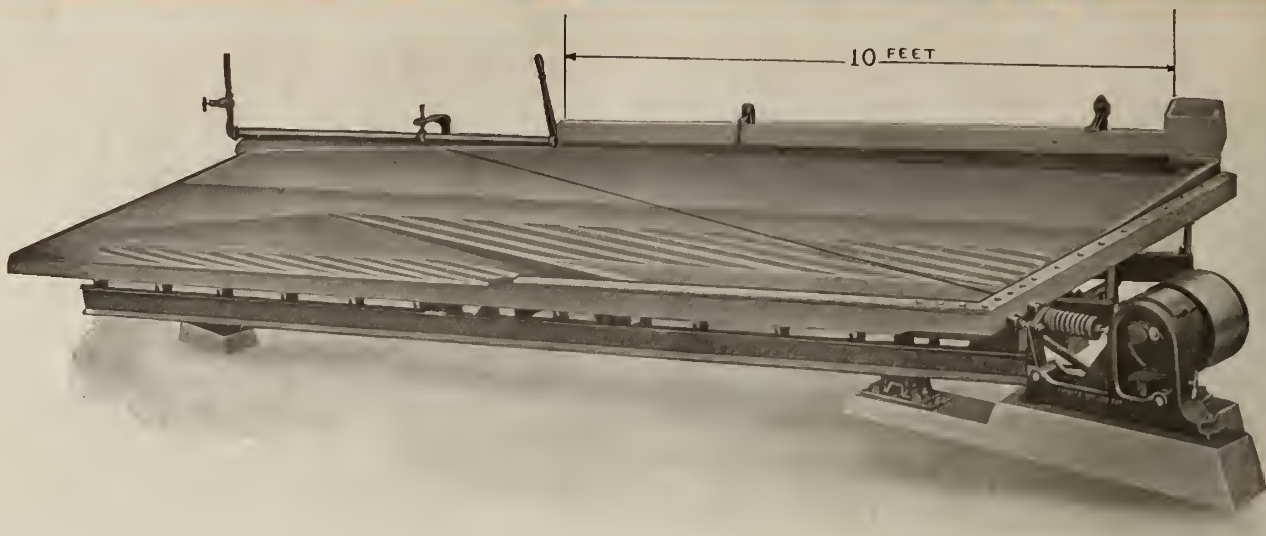


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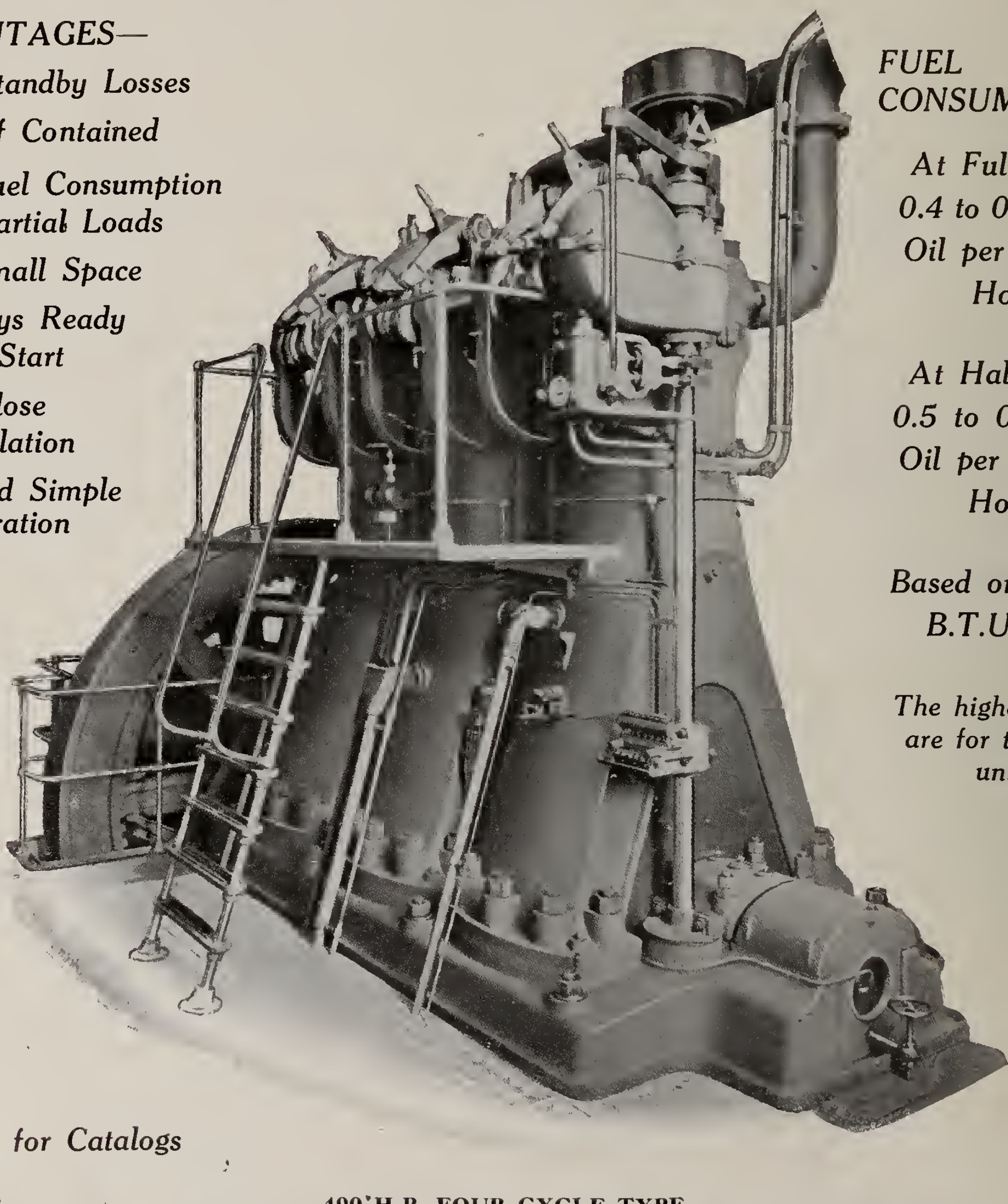

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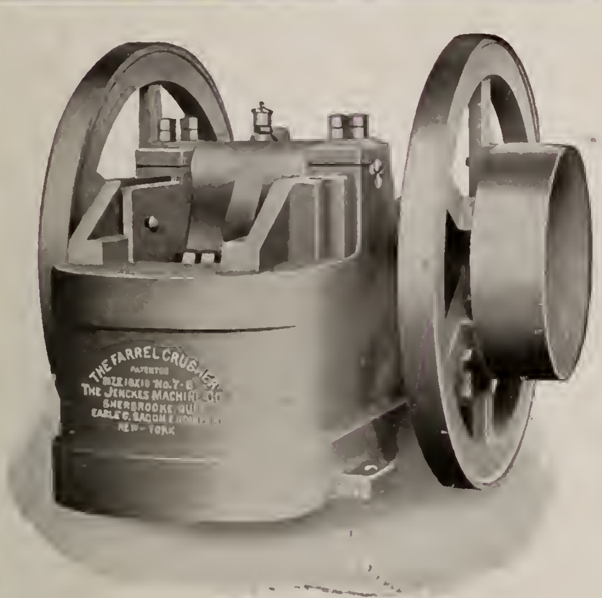

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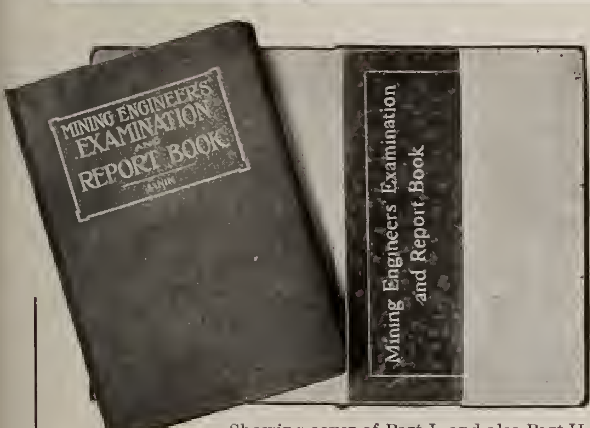


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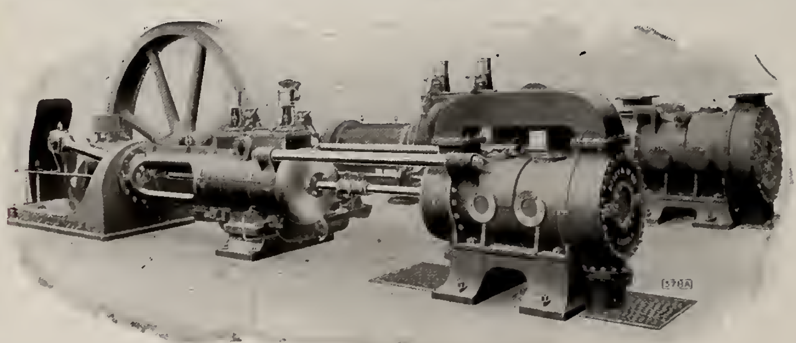

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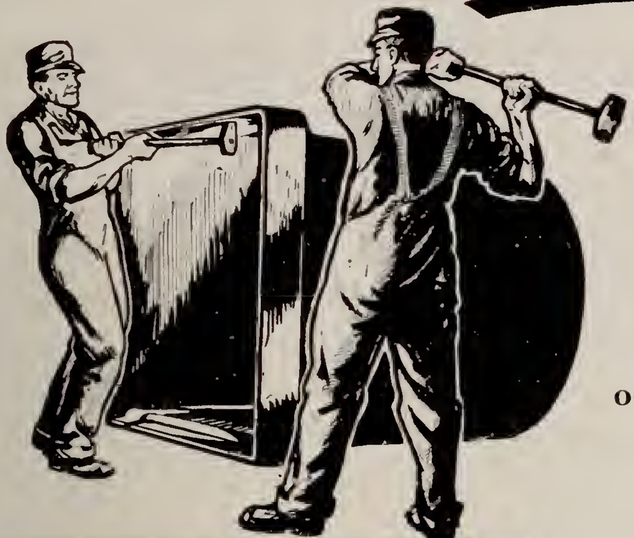

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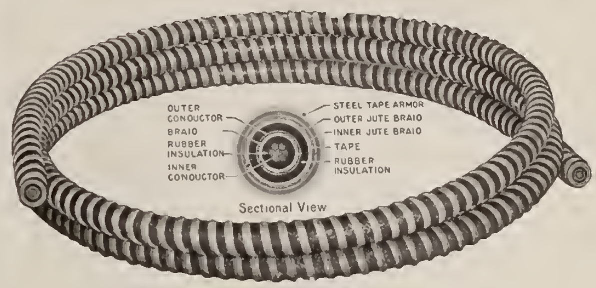


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# THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, May 1, 1913. No. 9

## The Canadian Mining Journal

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.



## COMMISSIONER PRICE'S REPORT

The results of the informal enquiry conducted by Mr. Samuel Price, Mine Commissioner for Ontario, have been embodied in a report to the Honourable W. H. Hearst, Minister of Lands, Forests, and Mines. Taken in its entirety, despite the fact that there is much internal evidence of Mr. Price's unfamiliarity with the practical aspects of mining, the report can be described as painstaking and, in many respects, accurate. We are convinced, however, that those in authority intended from the first to pass the act limiting the time of underground labour to eight hours per day.

Mr. Price states at the outset that his investigation for the most part took the form of an informal enquiry, although every opportunity was given to employers, managers, and workmen to voice their sentiments individually and collectively. In his endeavour "to ascertain and understand the nature of underground employment in the mines and the conditions under which men work," the Commissioner communicated with mine managers throughout the Province, held public meetings in various mining centres, caused secret ballots to be taken amongst the men, and corresponded extensively with officials in other countries. He claims, in effect, to have given equal opportunities to both mine owners and employees. Whether he could or could not do this is a question that we shall touch upon very briefly. As there are about 4,000 men employed underground in the Province, and as each presumably has a vote, it is frankly to be doubted whether a Government official could handle the situation without at least a tincture of unconscious bias. The Government has far too much at stake to take unnecessary chances. Far be it from us to accuse the Ontario Government of deliberate unfairness; yet we cannot but percieve the unwisdom of the method chosen.

In discussing the attitude of the men, the Commissioner said that nearly all are in favour of an eight-hour day. Out of a total ballot of 344, only 12 voted adversely to the proposed limitation of hours. "In nearly all the mines where the ballot was taken, I am satisfied," says Mr. Price, "that the men as a rule are well treated *and not at all dissatisfied in general* with the way they are used by their employers." The italics are our own. The clause italicized is most significant. Could a similar statement be made concerning any other industrial occupation? And why, in the name of reason, should the mining industry be selected by a paternal Government when there are numberless real abuses crying for attention in other industries?

The only apparent explanation can be found in the 4,000 reasons referred to above.

The principal arguments adduced by the men in favour of the change are: That underground work is unnatural and trying; that the hydraulic air used in Cobalt is "not as good as the air of the ordinary compressor;" and that eight hours of work is the longest continuous period in which efficiency can be maintained. To these claims it may be answered that underground work is no more "unnatural" than work in any building, or on a ship, or on a locomotive. And, as a matter of fact, it is infinitely more wholesome and much more remunerative than the majority of vocations. As to the implication that the hydraulically compressed air used in many Cobalt mines is detrimental to the health, we may frankly say that we do not believe it. That eight hours of efficient work is all the ordinary man is capable of, may or may not be true. This depends much upon the men, and to some extent upon the manager. It is demonstrable, however, that under present conditions it is practically impossible to be sure of more than six, or at most, seven hours of actual labour from the men. Supervision of underground labour is costly and difficult. This is a point that has been overlooked by Mr. Price.

The mine managers, according to Mr. Price, were practically unanimous in opposing the eight-hour day. Less than half a dozen managers were wholly in favour of it. Others signified their approval of the change if the hours were to be calculated "face to face." It was specifically pointed out that an eight-hour day would induce a reduction of wages and much dissatisfaction among the men. That, further, it would decrease outputs and lessen profits, and that many low grade deposits would be removed from the category of commercial possibilities. The contention that underground labour is injurious to the health was flatly contradicted by the managers. And in this last item they had, beyond doubt, by far the best of the argument. But, as noted before in these columns, the statement that Cobalt has reason to fear competition with Mexican silver producers is vain and foolish.

In reviewing the whole matter, Mr. Price expresses the belief that no one can predict what the effect of the enactment of an eight-hour law will be. A slight increase in the cost of production will, he admits, be probable. It will not, however, have any serious effect. Amongst the specific ills to be feared is the growth of miners' phthisis, a disease not at present known in Ontario mines. Parenthetically, we would like to ask Mr. Price how an eight-hour day can prevent the development of this malady? The steps to be taken for its prevention are well known. They consist chiefly in the application of water sprays for allaying drill dust. The mechanical devices necessary can be adopted whenever occasion arises.

Mr. Price admits that there is not an abnormal percentage of sickness amongst the miners. But, in discussing the relative healthfulness of underground work, he entirely omits consideration of the fact that the miner is not exposed during working hours to inclement weather and to variations of temperature. In fact, year in and year out the miner works in an atmosphere the temperature of which is practically standardized. This applies particularly to Ontario mines, none of which are deep enough to develop an appreciable increment of temperature.

Space forbids us to touch upon many of the points brought forward in the report. Suffice it to say that there is every evidence of painstaking care. It is observable, however, that Mr. Price, in his summation of conclusions, has been at some pains to labour those points that are in favour of the proposed change. This may be illustrated by one paragraph: "I think there is something, too, in the contention that the shorter day would tend to greater skill and efficiency of the men, and that by improving conditions it would encourage a more permanent class of residents in the mining camps and lessen the very large remittances of wages now sent out of the country by those having no established home here."

From the tone of this paragraph we are led to conclude that Mr. Price forgot the important fact that his function was primarily judicial. He seems to be not the judge but the advocate.

## METAL MINE ACCIDENTS IN THE UNITED STATES.

Comparative statistics show that fatal accidents in the metal mines of the United States are deplorably numerous. During the calendar year 1911, for instance, of the 165,979 men employed in the metal mines of the States, 695 were killed, a rate of 4.19 per 1,000 men employed. In the Transvaal, where labour is less intelligent, the rate is higher, 4.29 per 1,000. But in Great Britain, Germany, France, Spain, Australia, Japan and other countries it is markedly lower. The lowest rates obtain in New Zealand and Australia, where records show less than one man killed per 1,000 men employed.

As might be expected from the nature of the work, the great preponderance of metal mine fatalities mean the death of one man at a time, rarely more than ten or twelve. In coal mines the majority of reported accidents are catastrophes involving the deaths of scores.

The copper mines of the United States employ about 30,000 men underground. In these mines the death rate from accidents is 5.33 per 1,000 men employed. In the iron mines the rate is 4.29; in the zinc and lead mines, 3.43; in gold and other metal mines, 3.95; while in other mineral mines the rate is 1.73.

Striking a general average for all mines other than coal mines, falls of rock from roof or wall accounted during 1911, for 27.48% of all underground fatalities; explosions for 8.92%; haulage accidents for 2.88%;

mine fires for 5.32%; falling down shaft, 8.20%, and objects falling down shaft, 4.15%. These are the most serious causes. In addition to State inspection and Federal control of explosives, the most important work being done in the direction of prevention is the publicity being given in the form of detailed information collected and distributed by the U .S. Bureau of Mines.

## TEMISKAMING ANNUAL REPORT

Few mining companies have been such storm centres as has been the Temiskaming Mining Company, Limited. Its pugnacious president, Mr. Burr E. Cartwright, however much he has been criticized, and however much he may have merited that criticism, is certainly a generalissimo of no mean ability.

The authorized, and issued capital of the company is $2,500,000. Including $300,000 distributed during the calendar year 1912, the mine has yielded altogether $1,309,155.56 to its shareholders. Last year's net earnings amounted to $413,615.87, of which sum $300,000 went to dividend payments and the remainder was carried forward as balance, making the total surplus $590,591.71. The production of silver for the year was 1,242,243 ounces. an increase of only 28,489 ounces over the previous year. One noteworthy item is the production of 16,037 pounds of copper, the first commercial shipment of that metal from Cobalt.

A substantial lessening of operating costs is reported by the general manager, Mr. Norman R. Fisher. The cost of breaking and raising 31,449 tons of ore was $166,256, or $5.28 per ton, whereas the average cost during the year 1911 was $6.85.

Milling costs also were lowered. In 1911, the cost per ton of ore treated was $1.99; while during 1912 the average cost was reduced to $1.72. Mill recovery was improved, being brought up from 80% to 82.1%. In brief, the technical history of the year appears to be eminently satisfactory save for the fact that no statements, beyond vague references to promising new developments, have been made as to ore reserves. The mine maps indicate in a general way that the mine's future must depend very largely upon the results of prospecting. The ore available may not be sufficient to maintain production for more than half a year. On the other hand, the history of the Temiskaming encourages the belief that prospecting will be handsomely rewarded. And it is doubtful whether the development of regular ore reserves is commercially practicable.

The North Dome mine, the Temiskaming Company's property in South Porcupine, is dismissed in one brief paragraph. Hence there is no basis furnished for discussion.

Mr. Fisher deserves much credit for the workmanlike way in which the report has been prepared. His tabulation of costs is admirable. Both the engineer and the printer have taken pride in turning out a good job.

## CONCERNING THE BARTLETT.

We have before us one of the most extraordinarily inaccurate mining reports that it has ever been our painful duty to peruse. The document purports to deal with the Bartlett mine, Gowganda, Ont., and to it is affixed, in typewriting, the name "H. Brian Pearson." From beginning to end it is a strange medley of inaccuracy and misstatement.

The author, in his opening paragraph, informs us that the T. & N. O. Railway will, in the near future, be completed to within one and a half miles of the mine. This, we fancy, will be news to the Government and to Chairman Englehart. This, however, is merely a "marker." One statement reaches the ultimate of futility. "It is noticeable," runs the report, "that in each instance when either nickel or cobalt bloom obtains at the surface, a shoot of rich silver ore has been found by sinking." Nothing more completely misleading could be put in words. Only an incompetent or a knave could write such nonsense.

It is needless to quote further. Mr. Pearson's report is a masterpiece of silliness and distortion. But, futile as the report may seem to those who know the region, it is unfortunately true that the great mass of outsiders can readily be deceived. In other words, reports like this are mischievous and dangerous. They discredit the district and the profession.

If Mr. H. Brian Pearson be actually responsible for this "pipe dream," he should certainly be visited with condign punishment should be venture to call at Gowganda in the future.

## EDITORIAL NOTES

That poor dear Mrs. Ella Rawles Reader has at last come to grief. As promoter of the Calumet Metals Co. she won the confidence of not a few of our wealthy men. She sowed the wind, and now the inveigled shareholders are reaping the whirlwind.

Mr. W. A. Caldecott has calculated and tabulated the weight of tube mill pebble loads for 22-foot mills of diameters ranging from 54 inches to 63 inches. The loads are graduated by inches from 12 inches above the axis to 12 inches below, and the weight of a cubic foot of pebbles is taken as 105 lbs. For a 54-inch mill the maximum load is thus 14.21 tons of pebbles, the minimum 4.16 tons; while for a 63-inch mill the corresponding figures are 18.42 tons and 6.58 tons.

A recent writer comes to the conclusion that, to avoid errors in sampling and assaying ores that carry coarse gold, certain precautions are effective. When, for instance, relatively few grains of unusually coarse gold are present, the sample should not be put through a finer mesh than 30 or 40-inch, and fusions should be made in triplicate, abnormally high results being rejected.

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The Mines Branch of the Dominion Department of Mines has issued a bulletin giving a list of all Canadian coal mines. The tabulated information includes the names of the operator, the head office address, the colliery designation, the location of the colliery, the mine office address, and the name of the manager. This will be of great service to many engineers, machinery men and investors. Incidentally, we note that our old friend, "Dr." Hugo von Hagen is named as manager of three coal companies in New Brunswick. How this same von Hagen has eluded so long the clutch of the law is a mystery to us.

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The amount of time and labour being expended upon the volumes under preparation for the International Geological Congress is astonishing. The Coal Atlas itself includes more than 70 maps, many of which are printed in four colours. The text of the three volumes, which are now in press, is three-quarters English and one-quarter French and German. The coal resources of every country in the world are dealt with. Proof reading alone is a task of considerable magnitude.

# CORRESPONDENCE

## CORE DRILLS

Toronto, March 25, 1913.

Editor Canadian Mining Journal, Toronto, Ont.

Sir,—In pursuance of your request of this date, I beg to state that the illustrated lecture given by me before the Canadian Mining Institute on March 7th consisted of an exhaustive series of notes taken on shot drill operations in various parts of this continent and Europe. It had to do particularly with core drill work where cores are being recovered from 3 inches in diameter to 29-inches in diameter. 70 lantern slide pictures accompanied the article along with many data as to costs, speed of drilling, cost of drilling outfits, etc., under different conditions. An interesting picture was shown on "Core Drilling in China" before the Christian era. In connection with this picture it may be noted that many of the drilling terms used by the Chinese are still in use to-day.

I find it generally true that mining engineers, as a whole, know but little of core drill work where cores have to be recovered of over 3-inches in diameter. Notwithstanding this, there is a large amount of core drill work going on where cores are being recovered 16½ and even 29 inches in diameter. Pictures were shown of this work.

P. H. MOORE,
Mining Engineer for the Canada Foundry Co.

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# THE GOLD OF THE KLONDIKE

By J. B. Tyrrell, F.G.S.*

The Klondike gold-bearing district, in which placer deposits were discovered in the summer of 1896, is situated near the extreme north western part of the Dominion of Canada, between north latitudes 63° and 64°, and about fifty miles east of longitude 141° west, which forms the boundary between Canada and the United States territory of Alaska. Its area is not clearly defined, but for the purpose of this paper it may be considered as being about eight hundred square miles, with a width in a north and south direction of 28 miles and a length in an east and west direction of 36 miles.

In general character, the Klondike may be considered as being a small and nearly isolated mountainous region lying to the east of the great valley of the Yukon river, to the south of the smaller valley of the Klondike river, and to the west of the still greater valley which runs to the south-west of the Rocky Mountains. On its southern side it is more or less closely connected with irregular mountainous ridges to the south of it, but the valley of the Indian river separates it more or less completely from them, except in the extreme south-eastern portion.

The lowest point in all this region is the bed of the Yukon river, where the Klondike river joins it at the City of Dawson, with an approximate elevation of 1,200 feet above the sea.

The highest point is situated about the middle of the area, twenty-nine miles south-east of Dawson, and is known as the "Dome." This is a hill or mountain with an approximate elevation of 4,250 feet above the sea, or 3,050 feet above the Yukon river at Dawson.

*Abstract of paper read before the Royal Society of Canada.

From the Dome the country declines gently in all directions towards the valleys above enumerated, the drainage being carried off by short streams which radiate west, north, east and south, and flow into these larger streams.

The smaller streams are fairly mature in character. Many of them beginning in cirque-like depressions in the vicinity of the Dome, continue outwards with gradually decreasing grades without falls or other sudden interruptions, until they reach their mouths, while the smaller tributaries which join them on both sides flow quietly into them without any sudden changes of grade or without any waterfalls tumbling down from hanging valleys.

The area is completely isolated from any other drainage. No streams cross the district from any mountains or high lands outside of it, and there is no evidence that any streams have ever so crossed the district.

As, therefore, no glaciers have ever reached the country from any of the country to the north, or from the surrounding or adjoining mountains, and as no streams have crossed it, the problems of denudation and transportation which it presents are entirely confined within its own boundaries.

All the loose material which is found on its hills and ridges is derived from the immediate vicinity, and all the sand, gravel, or other detritus which is found in its valleys, was derived from the sides or bottoms of those valleys themselves, and none of it was brought from a distance.

**Geology.**—The rocks which underlie most of the gold-bearing district consist of altered quartz-porphyries, and porphyrites, probably of pre-Cambrian age, which have been squeezed and altered into chloritic and sericitic schists. In most places these are now standing at high angles and are striking in various directions.

Included in these schists, and usually running with their strike, are numerous veins and stringers of light coloured quartz. In some of these veins free gold has been detected, and it would appear probable that most of the gold in the district has been associated with, or has been derived from, these quartz veins.

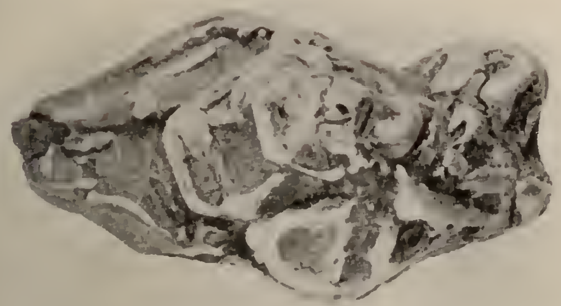


Fig. 1

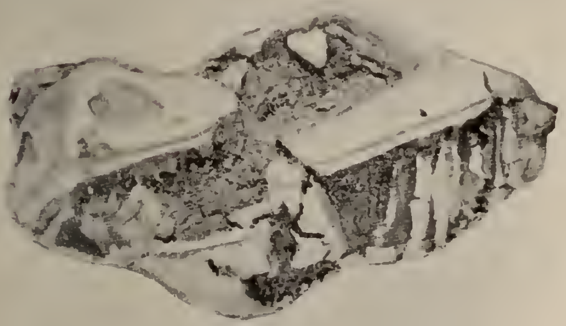


Fig. 2

Fig. 3

Fig. 4

**Figs. 1 and 2—Spinel Twin with hollow faces.**
**Figs. 3 and 4—Cube with hollow faces, &c.**
**Gold Crystals.—Magnified $2\frac{1}{2}$ diam.**

Both to the north and south of these fissile schistose the rocks are highly altered gneisses or hard quartz-mica schists, containing some bands of limestone. These gneisses, etc., also carry irregular quartz veins, and these veins doubtless also contain a little gold, but they would not appear to contain as much gold as the veins in the chloritic and sericitic schists previously mentioned.

Intrusive masess of igneous rocks, such as granite, peridotite, diabase, andesite, etc., occur here and there around the border of the chlorite scists, but as far as is at present known, there is no definite connection between any of these intrusives and the occurrence of gold-bearing veins.

Overlying all these rocks, except the andesites and their associates, Cretaceous or early Tertiary sandstones—and conglomerates occur to the north and south of the chlorite schists. In some cases they would appear to have been somewhat folded and contorted, though not to the same extent as the older rocks.

It has been claimed, apparently on good evidence, that some of these conglomerates contain gold, and they may thus be ranked as ancient placer deposits, but gold has never been found in them in paying quantities, and consequently they have not been studied as fully as the later gravels shortly to be described.

In all these rocks, but especially in the chloritic and sericitic schists, which have been called by Mr. McConnell, of the Geological Survey of Canada, the "Klondike Series," gold is found in greater or less abundance in the quartz veins which traverse them. It has also been found in the schist in minute quantities apparently not associated with the quartz at all.

These facts should be carefully borne in mind for all the gold in the detrital and placer deposits in the Klondike has been derived directly from these altered rocks occurring in the immediate vicinity of the alluvial deposits.

The gold of the Klondike occurs originally or primarily in quartz veins in the chlorite and serecite schist chiefly of the Klondike Series, as defined by Mr. R. G McConnell.

These quartz veins are usually lenticular in shape and rarely continue for more than a few feet in horizontal length. As a rule very little gold can be seen in them. As a result of a number of assays I found that while they usually showed traces of the metal, they rarely contained more than $1 to the ton. In some cases, however, notably in some quartz veins near the heads of Gay and Victoria gulches, two tributaries of Eldorado and Bonanza creeks, these veins were seen to contain coarse nuggety gold associated with pyrite. Some of it was distinctly crystaline in character, and among the crystals were a number of small triangular plates representing "spinel twins," the twinning being parallel to the octahedral face of the crystal. I had found some of these crystals in gold dust brought from Victoria gulch in the early days of mining in the Klondike, and afterwards, while examining the quartz veins at the head of the gulch, in company with Professor Henry A. Miers, F.R.S., we found a few more crystals of a similar character. Some of the crystals found on Claim No. 7, Victoria gulch, are represented on Plate 1.

In addition to the gold found in the quartz veins it is possible that some is associated with the schist itself. But none of the quartz veins so far discovered have proven rich enough to be worked at a profit, and the gold production of the Klondike has been derived exclusively from its placer deposits.

**Placers.**—Placer deposits may be defined as "Detrital deposits of heavy metals or minerals mechanically concentrated by natural agencies."

The Yukon Placer Mining Law gives the following definition: "Placer ground means any natural stratum or bed of earth, soil or gravel, containing gold or other valuable mineral or stones, derived from the disintegration of older deposits, and transported to, and concentrated in, their present position by the mechanical agency of water, but does not include mineral in place, or as defined in Part III, or the disintegrated portion of a vein, lode or rock, lying above or about such vein, lode or rock and clearly derived therefrom." This is entirely too narrow for a general definition of placers, because, while those in the Yukon have been chiefly formed and concentrated through the agency of water, some few are composed of residual or slidden material, while in other countries instances have been recorded of moraines formed in front of a glacier being profitably worked as placer ground. If amended by the addition of the words "or other natural forces" after "agency of water" the definition would be improved.

Generally speaking, however, the placers of the Yukon are gravels which have been formed by the wearing down and redeposition of the rocks of the immediate adjoining country.

Of the processes which enter into the formation of placer deposits, the following are the most important: First, rock decomposition and disintegration, or weathering; second, transportation; third, concentration, and fourth, deposition.

**Transportation.**—As seen above this whole country once formed a moderately even plain at what is now a height of about 3,500 feet above the level of the sea. Since that time it has been reduced to its present configuration. The rocks were softened by weathering and were then transported by the agency of water down the slopes, and finally for the most part into the ocean. The weathering kept well in advance of transportation, so that the hills are still covered with softened rock.

The primary force which causes this downward movement of loosened material is gravity, but the presence of water helps to loosen and separate the particles of the rock from each other, and to allow the force of gravity to be transformed into motion. This influence, of course, differs on different portions of the rock, varying according to the relative weights or specific gravities of the various substances. For instance, the force of gravity exerts a far greater influence on gold, which has a specific gravity of 19, than it does on quartz, which has a specific gravity of only 2.6.

If water is included in the loosened or weathered rock, it causes it to move gently and slowly downwards. This movement is known as "creep," and almost all slopes are affected by it. A typical instance came under my observation on one of the hills adjoining Bonanza creek. A narrow dyke of dark basic rock cut vertically through the light green chloritic schists which formed the country rock of the district. When within ten or fifteen feet of the top, it turned sharply sideways towards the face of the hill and ran horizontally until it reached the surface, being quite clearly distinguishable from the lighter coloured rock all the way. It had been originally vertical throughout; but the creep of the upper softer portion of the schists which enclosed it had turned it over so that its upper portion assumed a horizontal attitude.

This creep has a considerable influence on the formation of placer deposits, as it tends to constantly move the loosened soil and earth down from the hills into the bottoms of the valleys.

But the principal agent in the transportation of the loosened rock, and also in its concentration, is water flowing on the surface, either in minute rivulets or in larger streams.

After a heavy fall of rain little rills are formed all over the ground, and these flow downwards, carrying a load of mud with them, and gradually join together into larger streams, and finally into brooks and rivers. As they become larger with a constant slope they increase in velocity and consequently have greater carrying power.

*The following table gives the carrying power of a stream as exerted on quartz or rock of similar weight:

| Velocity of Current. | Size of material moved. |
|---|---|
| 3 in. per sec.=1/6 mile an hr. | Fine clay and silt. |
| 6 in. per sec.=1/3 mile an hr. | Fine sand. |
| 1 ft. per sec.=2/3 mile an hr. | Pebbles ½ in. diam. |
| 2 ft. per sec.=1.3 mile an hr. | Pebbles 1 in. diam. |
| 2.82 ft. per sec.=1.9 mile an hr. | Pebbles 2 in. diam. |
| 3.46 ft. per sec.=2.3 mile an hr. | Pebbles 3 in. diam. |
| 4 ft. per sec.=2.7 mile an hr. | Pebbles 4 in. diam. |
| 4.47 ft. per sec.=3 mile an hr. | Pebbles 5 in. diam. |
| 4.90 ft. per sec.=3.3 mile an hr. | Pebbles 6 in. diam. |
| 5.29 ft. per sec.=3.6 mile an hr. | Pebbles 7 in. diam. |
| 5.65 ft. per sec.=3.9 mile an hr. | Pebbles 8 in. diam. |
| 6 ft. per sec.=4 mile an hr. | Pebbles 9 in. diam. |

With rocks of equal specific gravity the carrying power of a stream varies according to the square of the diameter of the pebbles; or the volume of the pebbles which can be carried by a stream increases in the sixth power of its velocity; that is if the velocity is doubled, the diameter of a pebble which can be carried is increased four times, and the volume sixty-four times. Conversely when the current is reduced one half, the volume of a pebble (weight being equal) is reduced sixty-four times.

Thus a very slight increase in velocity greatly increases the carrying power of a stream. For instance, a stream flowing at one mile an hour has power to transport particles of a certain size, and if that stream increases in velocity to a mile and an eighth an hour, it becomes capable of carrying particles of double the volume, while if the velocity is decreased from a mile and an eighth to one mile an hour its transporting power is cut in two.

In this connection it must be borne in mind that the effective weights of different substances are not the same in water as in air. For instance, quartz which has a specific gravity of 2.6 has a specific weight in water of only 1.6, while gold which has a specific gravity of 19 has a specific weight in water of 18. Gold is therefore 7.3 times as heavy as quartz in air, while it is 11.25 times as heavy as quartz if weighed in water. It is therefore the specific weight in water of different substances which must be considered in connection with their transportation by water, rather than their relative weights in air. If the specific gravity is constant, the diameter of the pebbles which a stream can carry will vary as the square of the velocity, and if the velocity of the stream remains constant, the size of the pebbles will vary according to the specific weight of the substance composing them weighed in water. Thus, if one pebble is of quartz and another is of gold, which is 11.25 times as heavy as quartz weighed in water, the volume of a pebble of quartz which can be carried by the current will be $11.25^2$ or 126 times as great as that of a pebble of gold, and, assuming both pebbles to be cubes the diameter of the pebble of quartz will be approximately five times the diameter of the pebble of gold.

*Rivers of North America. By I. C. Russell, New York, 1909, pp. 18-19

With pebbles of quartz and gold of equal size it will take a current of $\sqrt{5}$ or 2.24 times the velocity to move the gold which it will take to move the quartz.

Again, if pebbles of quartz and gold of equal size are dropped into water the latter will sink to the bottom with more than three times the velocity of the former.

Now the quantity of material, or load, which can be collected by running water from the ground when it is covered with vegetation is relatively small, but when vegetation is absent and weathered rock is exposed to the direct influence of the rain and running water the load will often be very large, and consequently streams which carry away the wash from bare but weathered surfaces are often loaded to their utmost capacity.

In addition to the work done by water in carrying away weathered and softened rock, the streams themselves cut down their channels into the hard unweathered rock.

Where the water in the streams is clear and carries but little sediment this cutting action is very slow, or almost nil, but where it carries any considerable amount of sediment this sediment is pushed along on the bottom over the rock, and wears it down like a file, so that the bottoms of the streams, which are in this way deepening their channels, rarely, if ever, give evidence of the presence of a weathered layer of rock.

In the Klondike district it is certain that the valleys, both during the Second and Third Cycles of Erosion, were cut down by this process of downward erosion as narrow V-shaped gorges through unweathered rock to base level.

By the processes of erosion and transportation, the old Dome Peneplain has had deep and wide valleys cut in it, and most of the material derived from the cutting out of these valleys has been carried away beyond the limit of the district, either to the ocean or to some lower-lying land.

The lowest point in the Klondike area, which we are now considering, may be taken as the bed of the Yukon river at the mouth of the Klondike river, opposite the city of Dawson. In 1898 this was calculated by the author to be at a level of 1,200 feet above the sea, the calculation being then based on the assumption that the Yukon river from Lake Bennett to its mouth flowed in a parabolic curve. Since that time no exact measurements of the height of Dawson have been made, but a number of approximate levellings would indicate that the height so calculated in 1898 is not far from correct. The highest point in the area is the Dome, with an elevation of 4,250 feet above the sea.

Some years ago a contour map on the scale of two miles to the inch, with contour intervals every hundred feet, was prepared by Mr. R. G. McConnell and his associates of the Geological Survey of Canada. Some corrections were made to this map by the writer and then the area of each contour line was computed. Summing these areas together it was found that the district had a mean elevation of 2,600 feet above the sea. Assuming that the Dome Peneplain had a mean elevation of 3,500 feet above the sea, which is the elevation of those remnants of it which can be clearly distinguished, the country has been reduced under the influence of atmospheric and water erosion from 3,500 to 2,600 feet above the sea. This computation may be not strictly correct, for the Dome Peneplain may have sloped off towards the surrounding valleys, so that portions of it may have been lower than its remnants which are now recognizable, but on the other hand parts of it may have been higher than those parts which remain, and therefore it is probable that an elevation of 3,500 feet is not far from correct.

Taking a total area of 800 miles for the entire Klondike district and assuming that we are correct in our calculation that the country has been reduced 900 feet on an average, it would appear that 136 cubic miles, or 1,600 billion tons, of rock have been removed from this area since the downward erosion of the Dome Peneplain was inaugurated.

The work of removing this enormous quantity of rock must have taken a very long time, for it is not likely that rock weathers as quickly in that far northern country as it does farther south, and streams which are frozen to the bottom for half the year cannot cut down their valleys as quickly as those which have the whole year to work in. Besides that, the ground in the north has a tendency to be covered by a thick growth of sphagnum moss and other low vegetable organisms which prevent the water from wearing the surface away In the valley of the Mississippi it has been found that the country is being worn down at an average rate of about one foot in 4,000 years. If this rate is applied to the Klondike district it would mean that it has taken 3,600,000 years to reduce the Dome Peneplain down to the present configuration of the country. However, I am satisfied that the Yukon river does not carry away as much sediment as the Mississippi, and especially is this so if the glacial mud, which is brought down by the White river and other similar streams from the mountains, is eliminated from the computation. If the Yukon and its tributaries have eroded and reduced their valleys in past times at the same rate that they are eroding to-day, it is probable that a rate of one foot in 6,000 years, or even more, should be applied, in which case the time needed for the erosion of the Klondike district to its present shape would be 5,400,000 years or more.

**Concentration and Deposition.**—I have shown that the Klondike area was gradually worn down as an individual unit from the Dome Peneplain to its present shape in two successive periods, which have been here called respectively the "White Channel Period" or "Second Cycle of Erosion" and the "Recent Period" or "Third Cycle of Erosion." Both these periods may have been made up of two or more sub-periods, though that question has not been discussed here. Of the two main periods, the former, or White Channel Period, was very much the longer, and the greater portion of the erosion was performed during it.

While the erosion was in progress the eroded material was being carried down into the valleys and thence outwards to or towards the sea.

At first the streams were actively deepening or wearing down the bottoms of the valleys. Therefore these valleys were in the form of V-shaped gulches, from which all the finer and lighter material was being carried away, while the heavier particles, such as gold, magnetite, etc., were being scattered along the bottoms of these narrow valleys.

The particles of gold contained in the gravel or sand would be carried along by the water of the streams, over any smooth rock, until they would settle into crevices in the rock itself or into spaces between or among large loose rock masses, from which places they could not be dislodged except by upward currents. Such currents would first lift pebbles of quartz or similar rock less than five times the diameter of nuggets or particles of gold, before they would lift the particles of gold, even if the quartz and gold were equally accessible. But as a rule they are not equally accessible, for the lighter rocks being larger would stand higher than the particles of gold, and the spaces between them would hold and protect the smaller masses of the heavier metal from the current.

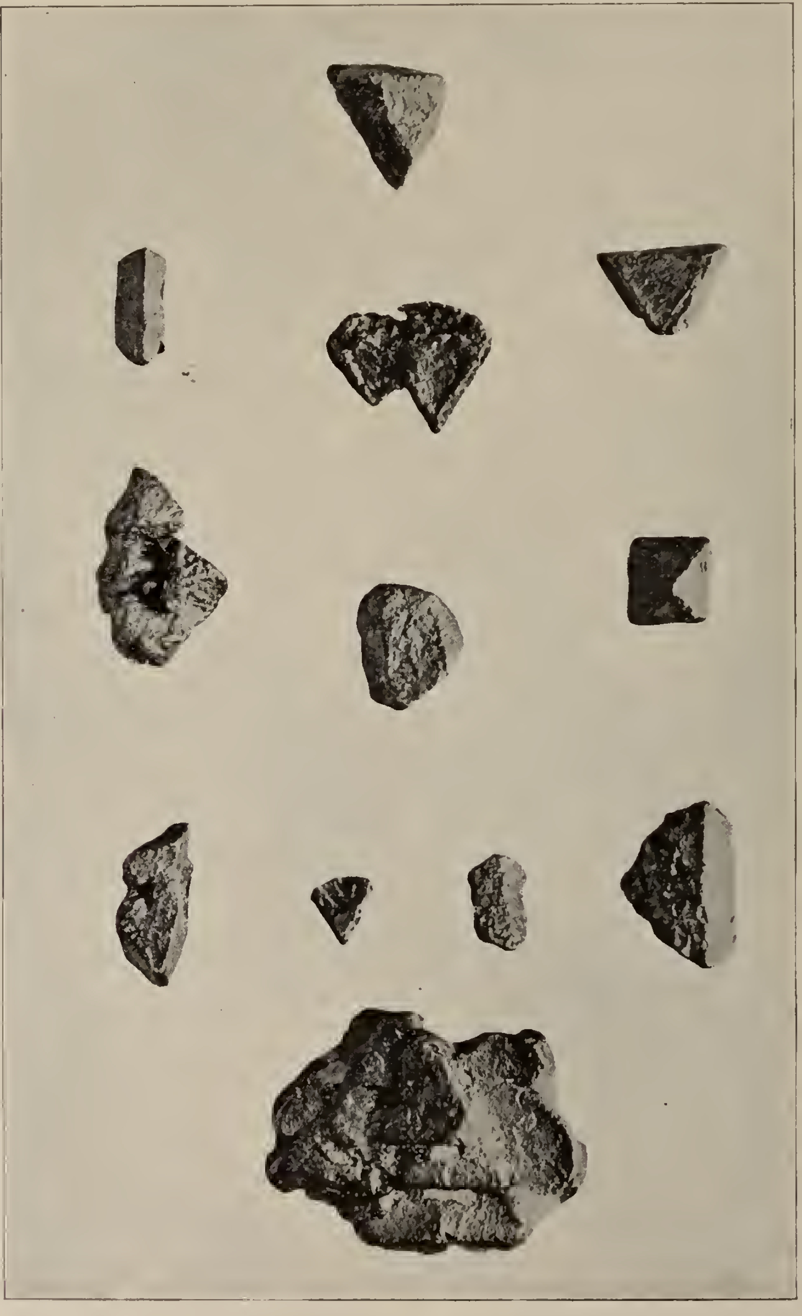
Thus the removal of gold by currents, after it has once been lodged, becomes exceedingly difficult as long as the crevices or spaces in which it is lodged persist.

While a stream keeps cutting its channel downwards new crevices or lodgment places are being constantly developed in the rock beneath the old ones which are being cut away. The gold keeps working down or dropping into them, and thus it moves almost vertically downwards with the deepening of the valley. In this way a streak or band of rich gold-bearing gravel would be formed in the bottom of the narrow valley, distributed in the crevices of the rock and in protected places immediately on top of it.

After the stream had cut the bottom of its valley down to grade or base level, and had ceased the process of vertical erosion, it would begin to cut laterally and to widen the bottom of the valley so formed, and to deposit sand and gravel in the form of flood-plains on it.

During this process of lateral erosion, the gold, which had already been collected from all the surrounding country into the bottom of the V-shaped valley, would be, to a large extent, below and out of reach of the influence of the meandering stream with its slower current. The stream would, however, continue to widen its valley and to extend its flood-plain and in many cases to build this flood-plain up to greater and greater thickness.

In this way we can see how such pay-streaks as that of the White Channel gravels of Bonanza Creek have been formed. They represent the gold collected in the



**Crystals of Gold from Victoria Gulch.—Magnified 2½ diam.**

old V-shaped valleys of that period, while the great thickness of gravel above and on both sides of them was deposited after these pay-streaks were formed.

Gold is usually not entirely absent from the upper and lateral gravels, for some of the precious metal was being constantly washed down from the adjacent hills with pebbles of quartz, schist, and other rocks; but the coarse gold of the pay-streak on and in the bed-rock was collected into its present position before the gravel was deposited on top of it, and it was not concentrated out of the gravel above it, as has often been assumed.

It may therefore be accepted as a definite law, that pay-streaks were formed on, and indicate the positions of, the bottoms of old V-shaped valleys.

If the bottoms of the present valleys are much wider than the paystreaks, this greater width represents the amount to which these valleys have been cut out by lateral erosion after they had been originally outlined to their present depth, and the gravels with which these valley bottoms are covered are later in age or newer than the pay streaks.

For instance, the old pay-streaks in the White Channel gravels on Bonanza and Hunker creeks which are well shown on Mr. McConnell's map accompanying his "Report on Gold Values in the Klondike High Level Gravels," run in very straight lines approximately down the middle of the old valleys, though possibly a little nearer their western than their eastern sides. The outlines given on that map for the approximate original boundaries of the White Channel gravels show the widths of the old flood-plains, and the extent of the gravels deposited over and around the pay-streak. The pay-streaks mark the positions of the bottoms of the original V-shaped valleys, and the gravels are flood-plain deposits which were subsequently laid down over and around them.

Similarly the pay-streak can be traced down the bottom of the present valley of Bonanza creek, marking the line of the bottom of the old V-shaped valley. In places this old valley bottom at one time crossed terraces in the present valley and then short strips of the pay-streak were left across these terraces. Later as the stream deepened its valley the botom swung round the terraces. Very often the pay-streak is not so rich around these curves, for it had to start anew without any gold to work on. The gold which is contained in this new portion of the pay-streak is not that which descended vertically with the growth downwards of the valley, but is rather that which was brought down the valley by the stream after the terrace was formed, or the little which was brought into it from the sides.

At the present time I am collecting information on the presence of these low terraces and their influence on the value of the pay-streak in the adjoining deeper valley; but the matter is not yet ready for publication.

In this connection attention may be drawn to the fact that while the gold and the heavy minerals associated with it in the pay-streak represent a concentration from the whole of the material first eroded from the Dome Peneplain, that in the overlying and surrounding gravel only represents a concentration from the surface of the country after the present valleys were cut down to base level at practically their present depths, and after flood-plains began to form in them.

It may also be interesting to point out that the law above annunciated, namely, that the pay-streak marks the bottom of the old V-shaped valley, should be of interest to all students of physical geography, since, wherever it can be found, it furnishes a datum line from which the growth of the valley outwards can be followed and studied. Even where a pay-streak carrying gold is not present in a valley, a band of heavy minerals or coarse rock fragments might be detected which would indicate the original position of the bottom of the V.

It is not improbable that gold may have a tendency to settle down through gravels and to collect on bed-rock below them; but this tendency exerts a minor influence in the formation of workable placers.

In McConnell's Report, pages 9 and 10, the gold values per cubic yard of two columns of gravel are given, taken from the hills beside Bonanza and Last Chance creeks, one 159 feet high and the other 90 feet high. These columns were unfortunately taken over the pay-streaks in which the gold existed before the gravel was deposited over it; but omitting the lowest 6 feet in each column which appears to contain the pay-streak, the rest shows an increase in value downwards, in the one case from .6 cent to the cubic yard to 18 cents a cubic yard, and in the other from .7 cent to the cubic yard to 11.4 cents to the cubic yard.

In the first column the total amount of gold contained in the upper 51 yards is $1.27, while the lowest 2 yards contained $8.26. In the other column the upper 28 yards contained $1.07, while the lowest 2 yards contained $4.40.

These values may give some indication of the relative amount of gold which was concentrated into the valleys, first, in the earlier stages of erosion when the pay-streak was formed, and the lighter material was carried away, and secondly, in the more mature stages of erosion, when the pebbles of quartz and other rocks were deposited with the gold.

The upper gravels probably contain almost all the gold that was eroded out of the rocks of the surrounding country while these gravels were being deposited, and if we knew the relative sizes of the particles of gold in the gravels and in the pay-streak, we might be able to form some idea of the percentage of the gold which had been worn out of the rock of the country and had been collected in the pay-streak; but unfortunately this information is not available at the present time. However, it is quite certain that the gold in the gravel is, on the average, much finer than in the pay-streak, and as the gravel gold doubtless represents closely the general character of that contained in the country rocks, we must assume that in the pay-streak much of the finer gold has been carried away, and that the coarser particles are all that have been left. It is hoped that it may be possible to compare these two runs of gold more fully at some future time.

If the erosion of a valley were to continue downwards uninterruptedly in rock of similar character throughout until its bottom should have reached base level before the stream which formed it began to erode laterally, the gold would be distributed in a continuous line along the bottom of such a valley and when the stream had afterwards widened it and had formed alluvial flats and flood-plains the pay-streak would be continuous through and under these alluvial flats.

But streams rarely, if ever, deepen their channels uninterruptedly in this way. Harder bands of rock cause obstructions, and elevations and depressions of the land cause the water to flow with different velocities at different times, so that at one time, or in one part of its channel, a stream may be cutting into the bottom of its valley, while at another time and in another part of its channel it may be filling it up and covering it with alluvial sand and gravel

In this way a stream with a valley of any considerable depth has probably formed a number of flood-plains at different periods in its history, and remains of these flood-plains may often be seen as terraces on the sides of its valley.

When a stream has formed a flood plain the pay-streak will, as we have seen, run beneath that flood plain on a line marking the original bottom of the old V-shaped valley and if, when the stream again begins to cut through this flood plain and into the rock beneath it, it follows the line of the former stream, or, in other words, if it follows the line of the pay-streak, it carries the pay-streak down with it; but if it diverges from this line, a portion of the pay-streak remains on the terrace. If it continues to deepen its channel until all the terrace is removed, or at least until that portion of it is removed which contains the pay-streak, the gold will also all be in the pay-streak in the bottom of the new valley; but if it reaches a new base level before the pay streak is all removed from the terrace a new condition is introduced. The stream may begin to cut into the side of its valley and may cut into and remove the old terrace containing a portion of the old pay-streak. In that case, the gold may drop down into the bottom of the valley with the eroded rock and gravel and form a rich pocket at one side of, and often quite off the line of the original pay-streak or it may be distributed along the channel which the stream happens to be following at the time. If the renewed stream happens to cut in to the old valley bottom to one side of the original pay-streak, or across it at several places and to diverge from it at a number of other places, the new pay-streak may be weak and indefinite, or it may be rich in spots and very poor between those spots, with other rich spots to one side or the other. In fact, it may assume a variety of characteristics, according to the manner of growth of the valley in which it has been formed.*

From these considerations it may be seen that continuous and regular formation of a valley will tend to the existence of a regular pay-streak, while discontinuous and irregular growth of a valley will form an irregular and disjointed pay-streak with many lateral apophyses.

In some cases it may happen that the rejuvenated stream will abandon the old valley altogether and in this way be removed from the influence of the old pay-streak. An example of this condition occurs on the lower portion of Bonanza creek, where, at about claim 80 below Discovery, the new valley leaves the old one, the stream having turned westward to cut out an independent channel through the country rock. As the creek during this later stage of its existence gathered but little gold from the rocks of the surrounding country, but rather depended for the richness of its placers upon that which had already been collected into the pay streak of the White Channel period, and as in leaving the old valley it had here left this old pay-streak entirely, the gold which occurs on this lower portion of Bonanza creek has either been carried down the creek itself from the higher parts of its valley, or has been brought into it by the stream flowing from Lovett Gulch which taps the White Channel pay-streak. The pay-streak is consequently not as rich here as it is farther up Bonanza creek, where it is directly beneath the former position of the old White Channel pay-streak, and contains much of the gold which that pay-streak formerly contained.

When we recognize that a pay-streak was formed in the bottom of a V-shaped valley at a time when that valley was being actively deepened, and when the bottom of the channel of the stream was composed of hard unweathered rock of the country, we can readily appreciate the influence that the character of the rock would have on its richness or poverty.

If the rock were hard and smooth the gradient of the stream would in that case continue higher than the average until base level had been reached throughout, the current would consequently be stronger, and the gold and coarse gravel would tend to be carried down to a more favourable location for settlement.

If, on the contrary, the rock were soft and fissile the gradient would be lower than over hard rock. the current of the stream would be slacker and the gold would have a better opportunity to settle down into the fissures and points that form riffles to collect it.

The conditions would be similar to those in a sluice-box. If the water flowed over a smooth bottom the gold would be carried away, and if it flowed over a rough and broken bottom with many openings in it, the gold would settle down in these openings.

As the stream cuts down into the bottom of its valley it will not under ordinary conditions, again pick up this gold that has settled into the fissures, except in cases where the supply of gold becomes too great for the natural riffles to hold, but rather as the surface of the rock is gradually worn down by the stream, the gold will be allowed to settle deeper and deeper below its original point of sedimentation. For instance, if gold particles have settled in fissures in a schistose rock these particles will continue to sink vertically for hundreds of feet if the fissures continue to persist, as long as the stream continues to deepen its channel on the same course.

**Character of the Gold.**—The general character and value of the gold found in the Klondike has been given in Mr. McConnell's "Report on the Gold Values in the Klondike High Level Gravels" and need not be repeated here. It all contains a considerable percentage of silver, but the quality varies to such an extent in different places that while the value of the gold on parts of Dominion creek is as high as \$17.75 an ounce some of that from Last Chance creek is not worth more than \$12.50 an ounce. The average value of the gold exported from the Klondike in 1905 was \$16.02 an ounce after it had been melted.

That in the bottoms of the valleys is generally well rounded and water-worn, or perhaps it would be more correct to say beaten round while it had been carried along by the water. But much of the gold in the White Channel gravels is more or less angular, and some of it is quite clearly crystaline. Many of the crystals are feathery and very delicate, and it is possible that some of these may have been deposited on the sides of other fragments, or around nuclei through the agency of water carrying gold in solution, which percolated downwards through the overlying gravel. But other crystals were undoubtedly formed in quartz veins and have been mechanically removed to the positions which they now occupy in the gravel. Those represented on Plate II are clear examples of this class. Figures 1 and 2 are two views of a twinned octahedron. Figures 3 and 4 show a cube with hollow faces and with the angles modified by the faces of the rhombic dodekahedron. Other crystals found by the writer have already been

*See paper by the same author on The Law of the Pay-streak, with illustrations, in Trans. Inst. Mining and Metallurgy, Vol. xxi (1912) pp. 593-605.

recorded by Professor Miers. They occur in a vein of quartz at the head of Victoria Gulch, and similar crystals have also been washed out of the gravel on some of the mining claims on the Gulch itself. They are octahedral twinned parallel to the octahedral face, and are usually in the shape of flattened triangular plates. Those shown on Plate I were obtained from Mr. Philip Holloway's claim Number 7, on 7 Pup, Victoria Gulch where Mr. Holloway very kindly allowed me to sort over his gold and take away these crystals.

**Associated Minerals.**—The minerals associated with gold in the camp are the following: Meteoric iron, native copper, graphite, magnetite, haematite, pyrite, cassiterite, quartz, rutile, garnet, epidote, kyanite, scheelite, awarnite, almandite, etc.

**Production.**—The ordinary creek claims in the Klondike had a length of 500 feet up and down the creek, and several of these yielded more than a million dollars, or an average of more than two thousand dollars to the running foot. Fraction A on Bonanza creek, at the mouth of Skookum gulch, had a length of 86 feet, and Richard Low, the owner, informed me that he had extracted gold to the value of between half and three-quarters of a million dollars from it, giving an average yield of from $5,800 to $8,700 a running foot of the claim. I was present at one clean up on this claim, after thirty hours' work by six men, and the clean gold recovered filled eight gold pans as full as it was possible to carry them without breaking.

Up to the present time placer gold mining in the Yukon territory has produced gold to the value of $140,879,500, about 99 per cent. of which has been taken from the Klondike district.

As we have shown this gold has been concentrated by ordinary stream and atmospheric agencies into the bottoms of the valleys from the rocks of the surrounding and adjoining country. As far as we know, it was first concentrated into the bottoms of the valleys of the White Channel period or Second Cycle, and part of it was again reconcentrated into the bottoms of the valleys of the Third Cycle.

Altogether there has been removed since the age of the Dome Peneplain about 136 cubic miles of rock, and the gold which was contained in these 136 cubic miles has, to a large extent, been concentrated into the pay-streaks and gravels in the bottoms of the valleys. The exact proportion of gold that has been retained in the valleys and that which has been carried away is not known, but the two hundred million dollars worth or ten million ounces of gold which was retained in the valleys would, if evenly distributed through the rock from which it was derived, amount to .013, or approximately 1/75 of a cent to the ton. It is thus clear that the Klondike placers owe their richness entirely to the peculiarly favourable conditions of concentration which have existed through a long period of time in that unglaciated district, rather than to any particular richness of the rock from which the placers were originally derived.

Another feature of interest may be worthy of mention. The rocks in the Klondike are schists and slates of pre-Cambrian age, such as are generally recognized as being favourable to the occurrence of gold-bearing veins. Many quartz veins occur in these rocks, and in many of these quartz veins gold is distinctly visible, while in other veins it can be recognized in small quantities by assaying. The rock of the country is therefore distinctly a gold-bearing rock.

One hundred and thirty-six cubic miles of this gold-bearing rock were put through nature's mills and the gold contained in it was concentrated in nature's sluices, and from it a total of ten million ounces of gold, worth about two hundred million dollars, was extracted, proving the rock to contain an average gold content of at least 1/75 of a cent to the ton. What percentage of the gold contained in the original rock was saved we do not know; but if nature's concentration processes were not grossly inefficient the average gold contents of the gold-bearing pre-Cambrian rocks of the Klondike must have been very low.

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# NOTES ON THE SAN FRANCISCO MILL, PACHUCA, MEXICO*

By J. P. Holcombe, Student.

Some notes on this mill may be interesting, not only because it was the first cyanide mill erected in Pachuca, but also because it was the pioneer mill, in the western hemisphere, to use the Brown agitating tank, since called the "Pachuca" tank in America.

Originally built as a pan amalgamation custom mill, it was taken over by the Maravillas Mining Co. in 1910, since when both mines and mill have been worked under the same management.

The whole plant has been electrically equipped throughout, the power being supplied by the Mexican Light and Power Company from their hydraulic plant at Necaxa, some 90 km. (about 56 miles) away.

The capacity of some of the motors is much greater than is now required, owing to constructional changes in the past.

After many alterations the mill now consists of three 10 in. × 12 in. Blake rock-breakers; one 16 in. × 22 in. set of rolls; forty 1,250 lb. stamps; eighty Wilfley concentrators; four Dorr classifiers; three 13 ft. × 4 ft. 6 in. Krupp and one 15 ft. × 5 ft. Denver Engineering Works tube-mills; four 10 in. × 54 in. Frenier pumps; four Dorr pulp thickeners, three of these 24 ft. × 10 ft., and the fourth 30 ft. × 10 ft.; eight "Pachuca" tanks 45ft. × 15 ft.; two 22 in. bucket elevators, buckets set 18 in. apart; one Moore vacuum filter (movable type) with the necessary sumps, solution tanks, pumps, pulp storage tank, compressors, etc.

The ore, which comes from several mines and dumps varies in character a great deal, the value being chiefly in the form of silver sulphides, with some manganese, galena, zinc blende and pyrites, these latter being eliminated to a great extent by coarse concentration. The mill-heads for the past six months averaged 595 grm. (19.12 oz.) of silver, and 2.84 grm. (0.091 oz.) of gold per metric ton (2,204 lb.).

*From the Bulletin of the Institution of Mining and Metallurgy.

The ore is received in the "patio" or yard adjoining the mill, where it is weighed, and then trammed to the rock-breakers and rolls situated immediately above the ore-bin, which holds 450 metric tons. After passing over a grizzly of 2 inch spacing, the coarse ore is crushed to pass a 2½-inch ring, the rolls acting as a fourth primary crushing machine with distribution by means of a 18-inch Robins conveyor belt.

The ore is fed by "Challenge" feeders to the stamp-mill, which is driven from one line shaft by a 200 h.p. motor; the stamps make 100 drops per minute, the height of drop being 7 inches. The mortars stand on concrete blocks which extend to the masonry of the ore-bin, thus making a very substantial battery foundation and feeder floor. The screens in use have either six or eight holes to the linear inch, according to the class of ore treated.

Crushing is done in cyanide solution, and the pulp, after leaving the stamps, is concentrated on "Wilfley" tables, about 14 per cent. of the value being obtained by concentration. It then flows to the Dorr classifiers, the sand to be ground and re-ground in the tube-mills; the overflow, which for all practical purposes may be considered as slime, being conveyed direct by elevator to the cyanide plant. There are no cones in the mill.

The concentrate is conveyed by pipes directly from the tables to sumps in the concentrate storage room lower down the mill, thus obviating chances of theft and saving labour, the clear overflow from these sumps joining the mill solution.

The three Krupp mills make 28 revolutions per minute, being driven from one line shaft by a 200 h.p. motor, and the Denver mill, 26 revolutions per minute, by a separate motor of 75 h.p. The battery motor and the large tube-mill motor are so placed that, in case of a breakdown of either, one-half of the mill can still be run by mounting belts on pulleys, which are always in position on the battery line shaft and tube-mill countershaft. One motor drives the Frenier pumps and Dorr classifiers.

The stamps have a much greater capacity than the tube-mills, this fact explaining the low stamp duty, which for the past six months has averaged 5.570 metric tons per 24 hours.

The tube-mill feed is kept as thick as possible and contains about 35 per cent. moisture as it enters the scoop feeder. The Denver mill does better work than the others. The four mills are fitted with "El Oro" lining and mine rock only is used, it being fed as large as possible through a 6½-inch spiral while running. Formerly, imported flint pebbles only were used, then different proportions of pebbles and rock were tried, but the so-called selective action of the former in remaining in the ribbed lining was not apparent, and for the last year nothing but mine rock has been used. Even considering loss of time due to re-lining and extra expense of new liners, the difference in cost between the use of pebbles and mine rock is greatly to the advantage of the latter in this mill. The mills are kept as full as possible with rock, the consumption being 30.7 kg. (67.5 lb.) per ton of ore ground. This rock contains approximately 200 grm. silver (6.43 oz.) and is included in the mill tonnage.

The average life of locally-cast white iron liners is 8.5 months. Experiments are now being made with liners containing 25 per cent. steel, but no data are yet available. The pulp delivered to the cyanide plant averages 80 per cent. through 200-mesh screen.

All the tube-mills are placed in one line, end to end, with a space of 4 ft. between the discharges of Nos. 1 and 2, and 3 and 4, one man attending to the feeding of rock to two tube-mills. One 48-in. × 10-in. Frenier pump returns the discharge from two tube-mills for re-classification.

The overflow from the Dorr classifiers, having a consistency of 8 to 1, is elevated by an elevator with a belt speed of 250 feet per minute, and is discharged through pipes to the Dorr thickeners; the clear overflow from three of these joins the mill solution and that from the fourth is precipitated. The pulp from these thickeners has a consistency of 1.2 parts of solution to 1 of ore, and flows by gravity to the "Pachuca" tanks, where sodium cyanide is added to bring the strength of solution up to 0.4 per cent. potassium cyanide. The protective alkalinity is kept at about 2 lb. CaO per metric ton of solution, by adding lime to the tube-mill feed, the consumption being 4.4 kg. (9.7 lb.) per metric ton of ore.

Each tank is filled separately, and when filled, titrated and sampled, agitation is maintained for 36 hours, then follows a rest for 10 or 12 hours, after which as much agitation as time will allow before filtering.

While describing these tanks, I may say that the experiment of removing the top length, measuring 13 feet of the central column, has been tried on one tank for several months, giving no apparent benefit. Also for the air lift, plain unprotected nipples, 15 inches long, are in use in all these tanks and have not given any trouble.

No lead acetate is used in the "Pachuca" tanks, but an amount equal to 300 grm. (0.66 lb.) per metric ton of ore crushed, is added to the mill solution at regular intervals. The consumption of potassium cyanide per ton of ore crushed is 834 grm. (1.83 lb.).

The pulp after treatment is pumped by centrifugal pumps to the storage tank which feeds the filter plant.

One basket of 40 leaves is constantly working. There is a complete spare basket, also spare leaves. The working leaves are given an acid bath every month. This filter treats, with one basket only in use, 220 tons of ore per 24 hours; it started working 13 months ago, and has given very satisfactory results. The cakes are discharged by water under a 20-ft. head.

A cycle is as follows:

| | Minutes |
|---|---|
| Making cake 1¼ inches | 20 |
| Transfer to barren solution tank | 3 |
| Barren solution wash | 40 |
| Transfer to water and discharge tank | 3 |
| Water wash | 15 |
| Discharging cake | 5 |
| Total | 86 |

The filtered strong solution, and the first ten minutes or so of solution wash, is pumped to the pregnant solution tanks for precipitation, afterwards joining the mill solution, the rest of the solution wash being precipitated apart, then returned to the filter for cake washing.

The precipitation and melting house contains ten 5-compartment zinc boxes, each compartment being 36 inches × 33 inches × 39 inches high, above the trays where 4-mesh screen is used. Nine of these boxes are packed with zinc, and a clean-up is made every week. The zinc consumption per kilo of bullion produced is 1.101 kilos (2.42 lb.). Precipitation is good, the zinc box effluent hardly ever reaching 2 grm. (30.8 gr.) of silver per ton of solution. All zinc washing is done in solution, the discharge from the precipitate press being pumped to the head compartments of two zinc boxes.

The precipitate is washed through a 40-mesh screen and pumped into a ½-ton Shriver press; it is given no acid treatment, contains 80 per cent. to 85 per cent. bullion, and is discharged after passing compressed air through it for 20 minutes, the precipitate then containing about 28 per cent. moisture. There is a strong-room in which the car containing the precipitate is kept overnight for melting the next day. There is also a bullion safe inside the strong-room.

Originally there were six coke furnaces, but three of these have been converted into oil furnaces with good results. Morgan No. 300 crucibles are used, and the flux is borax glass 7 per cent., soda ash 5 per cent., lime 1 per cent., and sand 2 per cent. With this flux the bars assay from 910 to 940 fine in silver, with four to five parts gold, and weigh from 32 to 35 kilos (70.4 to 77 lb.) each.

The consumption of fuel oil per kilo of bullion produced is about 1.49 litres (0.328 gall.).

The air compressor equipment is as follows:

One Ingersoll-Rand duplex, class "J," simple air cylinders, 12 in. × 14¼ in., making 160 revolutions per minute, capacity 595 cubic feet per minute.

One duplex Ingersoll-Rand, 16 in. × 10 in. and 10 in. × 10 in. (converted compound), making 130 revolutions per minute, 675 cubic feet of air per minute.

One Ingersoll-Rand type XI., vertical, capacity 270 cubic feet per minute.

One of the first two supplies enough air for the agitation of six Pachuca tanks, one pulp storage ("Pachuca" type) and pulp tank of Moore filter, also blacksmith's shop. A pressure of about 30 lb. per square inch is maintained. When the melting furnaces are used the type XI. compressor also runs.

The average cost per metric ton of ore milled during the period January to June last, was as under:

| | | |
|---|---|---|
| Rockbreakers | $0.11 | 2.64d. |
| Batteries | 0.24 | 5.76 |
| Concentration | 0.04 | 0.96 |
| Tube-mills and classifiers | 0.29 | 6.96 |
| Agitation | 1.05 | 25.20 |
| Filtration | 0.16 | 3.84 |
| Pumping | 0.09 | 2.16 |
| Precipitation and melting | 0.41 | 9.84 |
| Sampling and assaying | 0.13 | 3.12 |
| General repairs | 0.17 | 4.08 |
| Surface expenses | 0.05 | 1.20 |
| Power | 0.81 | 19.44 |
| General expenses | 0.31 | 7.44 |
| Total | $3.86 | 92.64d.=7.72s. |

A Mexican peso is approximately 2s.

The actual extraction during this period was 92.4 per cent. of the silver, and 94.5 per cent. of the gold.

With the exception of the superintendent, day and night foremen, and precipitation house man, who are all English, local Mexican labour is employed throughout the mill.

## U. S. COAL MINE ACCIDENTS

The coal-mine accidents occurring in the United States during the year 1912 have been compiled by the United States Bureau of Mines under the direction of Frederick W. Horton. The publication which is now ready for distribution gives a resume of the accidents from 1896 to 1912 inclusive with monthly statistics for the year 1912.

Mr. Horton in reviewing the year says: "During the calendar year 1912 there were 2,360 men killed in and about the coal mines of the United States. Based on an output of 550,000,000 short tons of coal produced by 750,000 men, the death rate per 1,000 emplayed was 3.15 and the number of men killed for every 1,000,000 tons of coal mined was 4.29. The number of men killed was the least since 1900, the death rate per 1,000 employed was the smallest since 1899, the death rate per 1,000,000 tons of coal mined was the lowest, and the number of tons of coal produced in proportion to the number of men killed was the greatest on record. These facts offer indisputable evidence that conditions tending toward safety in coal mining are actually improving and that coal is now being mined with less danger to the miner than ever before. The general improvement in 1912 as compared with 1911 is shown by the following facts:

"In 1912 the number of men kileld in the coal mines of the United States was 339 less than in 1911—2,360 as compared with 2,719—a decrease of 13.2 per cent., and this in spite of the fact that there were more men employed in the mines and more coal mined than in any previous year.

"The death rate per 1,000 men employed in 1912 was 3.15, as against 3.73 in the previous year, a decrease of 15.5 per cent.

"During 1912 for every 1,000,000 tons of coal mined 4.29 men were killed, as compared with 5.48 men in 1911, a decrease of 21.7 per cent.

"There was 233,000 tons of coal mined for each man kille din 1912, as compared with 183,000 tons in 1911, an increase of 50,000 tons, or 27.3 per cent.

"Although the improvement in 1912 was greater than in any previous year for which accurate statistics are available, partly due, perhaps, to exceptionally mild weather during the last few months of the year decreasing the likelihood of disastrous coal-dust explosions, there has been an annual improvement for a number of years, as indicated by the accompanying table:

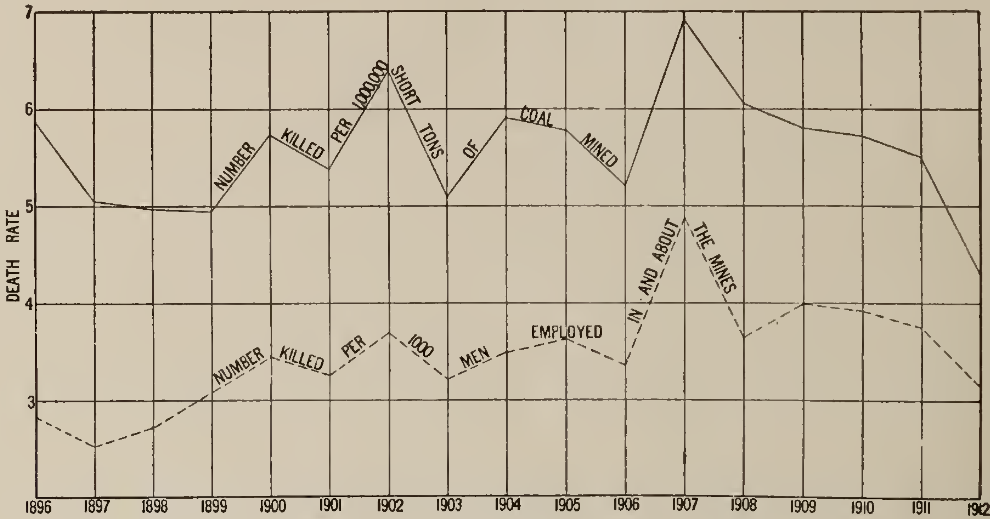
Number of men killed in and about the coal mines of the United States in the calendar years 1907 to 1912, inclusive, with death rates:

| | Number Killed | | | |
|---|---|---|---|---|
| Years. | Total. | Per 1,600 employed. | Per 1,000,000 short tons mined. | Production per death short tons. |
| 1907 | 3,197 | 4.88 | 6.93 | 144,000 |
| 1908 | 2,449 | 3.64 | 6.05 | 165,000 |
| 1909 | 2,668 | 4.00 | 5.79 | 173,000 |
| 1910 | 2,840 | 3.92 | 5.66 | 177,000 |
| 1911 | 2,719 | 3.73 | 5.48 | 183,000 |
| 1912 | 2,360 | 3.15 | 4.29 | 233,000 |

"It will be noted from the foregoing table that the death rate per 1,000,000 tons of coal mined has decreased annually, that the production per death has increased each year since 1907, and that the death rate per 1,000 men employed has steadily decreased during the last four years.

"This general improvement has been brought about by a combination of causes, the principal one of which has been more efficient and effective mine inspection on the part of the State mining departments and State mine inspectors throughout the country, supplemented by greater care on the part of both the operators and the miners. The investigative and educational work of the Bureau of Mines has kept both the operator and the miner alive to the various dangers connected with coal mining and has shown what precautions should be taken to avoid these dangers. The bureau is therefore gratified with the improvement shown, particularly as the greatest improvement relates to dangers concerning which the bureau has been conducting special investigations, as is shown later. The bureau, however, can not too strongly express its appreciation of the co-operation of the State mining officials and the operators in the work of making coal mining safer.

"Although there has been an annual improvement in mine-safety conditions since 1907, and a particularly notable one in 1912, a still greater decrease in the death rate can be effected. Whether or not such an improvement will be made in 1913 depends largely on the care exercised by the operators, superintendents, foremen, and all others in authority, and by the miners as well, to prevent the rise of dangerous conditions and to avoid unnecessary risks when such conditions have arisen."



Death rate per 1,000 men employed and per 1,000,000 short tons of coal mined for the years 1896 to 1912.

Copies of this report, Technical Paper 48, may be obtained by addressing the Director, Bureau of Mines, Washington, D.C.

# MOTOR FOR STAMP MILL DRIVE

A special motor for driving stamp mills has been recently placed on the market by the Westinghouse Electric and Manufacturing Co. after thorough tests in actual service have proved its suitability for this work.

The motor is mounted in a cradle which in turn is mounted on a heavy base plate. The cradle carries a back shaft to which the motor is geared. The back shaft pulley runs at slow speed so that it can be belted directly to the bull wheel of the stamp mill, thus eliminating the jack shaft and saving space, belting, the loss of power due to belt slippage, and the expense of maintenance of the jack shaft. The motor cradle can be slid along the base plate for belt adjustment, an especially long range of adjustment being provided.

The pulley is outside the bearing on the cradle so that the belt can be easily removed. The motor, gear and pinion can be removed without disturbing the line-up of the pulleys or handling the belt. The back shaft bearings are split and can be inspected or renewed after merely slackening the belt. The gears are enclosed in a dust-proof case and run immersed in oil.

The motor itself is extremely strong and rugged and is built to withstand the very severe service encountered in stamp mill drive. It is of the type originally designed for steel mill work where the worst operating conditions found in any industry must be successfully withstood.

This outfit can be supplied for driving mills of from 3 to 20 stamps, with stamps weighing from 80 to 1,250 pounds. One motor is ordinarily used for each battery and is shut down when the battery is not in use, thus avoiding a waste of power.

# SURF INLET GOLD MINES.

The following information concerning the Surf Inlet gold mines was recently contributed to the B. C. Mining Exchange, Vancouver, B.C., by Mr. Fred M. Wells, and is reproduced here for the reason that several Eastern investors were at one time interested:

The Surf Inlet gold mines are situated on Princess Royal Island on the coast of British Columbia, about 400 miles north of Vancouver City. The island, which is about 60 miles long and 25 to 30 miles wide, is a mass of rugged mountains with heavily-timbered valleys and beautiful fresh-water lakes, making it an ideal country to live in and operate mines.

The first discovery of gold quartz here was made many years ago by an Indian who reported the find to some Victoria people. An investigation was made, this resulting in the discovery of the quartz vein and location of the ground now known as the Princess Royal mines. Eastern people became interested in the property and a large amount of development was done. Ore was mined and shipped in small quantities, but eventually the work was given up because it did not return a profit. This gave the camp a "black eye," and for some years it was difficult to get mining men to visit the camp to investigate for themselves the merits of the mines.

It is not for me to say what was the real cause of the failure, but I understand the ore was sorted, packed out to salt water on horses, and shipped to the smelter. I am sure no profit could be made on the ore in that way, and I suggest that this was the cause of the failure. The owners had nice ore, and I feel sure a small mill installed on the ground would have made for them the success the eastern investors expected.

During the operation of the property some miner traced the fault line across the creek and up the mountain side opposite Princess Royal camp, and discovered the large outcroppings of ore that are now the Surf Inlet gold mines. In some way Mr. E. A. Cleveland, civil engineer, of the firm of Cleveland & Cameron, of Vancouver, became interested in the property and attempted in a serious way to make a mine out of it. About this time the work was closed down on the Princess Royal claims and Mr. Cleveland, being unable to interest capital to assist in continuing development, finally closed the camp down. About four years later the camp was brought to the notice of Mr. A. B. Clabon by some interested parties in the East, and it was arranged that I should make the trip in to examine both properties.

Late in the fall of 1909 I made the trip, and spent about ten days in the camp, and after returning to Vancouver secured from Mr. Cleveland an option for Mr. Clabon and myself. In the following spring I took in some men over the snow on snowshoes and commenced work under our bond. The results were so good that we at once formed the Surf Inlet Gold Mines Co., interesting in it prominent Vancouver business men, who have carried on work continuously since that time.

Though we are isolated from steamer routes, we have a regular force of 12 to 15 men working. Our camp is well equipped, and includes a complete assay outfit with an assayer on the ground, who keeps us informed on the value of the ore as developed—a necessary thing in a gold camp.

The country formation of Princess Royal island is mostly granite, locally called "coast" granite, rather dark in colour and somewhat stratified. The ore bodies are well defined and were formed along a great fault line. The fault has been subjected to much shearing and crushing along its course. The effect of this great rock movement has been in places very marked, brecciating and altering the granite rock for a distance of from 50 to 100 feet from the main fracture. The ore is a hard rose quartz, containing iron pyrite, outcropping boldly where cut by small creeks.

Work has been done and ore proven for some miles along the fault line, but no large amount of work except on the Surf Inlet Gold Mines Co.'s property, and the adjoining claims on the south belonging to the Princess Royal company.

There are often two parallel veins, and where the altered rock exists these veins or ore shoots seem most apt to form along the outer sides and in the contact of the solid granite and the altered rocks. The country has been very much eroded by glaciers, which have left a hard and unoxidized surface to all ore outcroppings, practically doing away with surface accumulations of value from weather effects. From a close observance of the ore as development attains depth, I would say that there was no re-enrichment of these veins near the surface, and that the gold value at present established will be permanent.

The quartz veins so far developed are rather small, except on the Surf Inlet property the vein on which has been proven to be from 10 up to 20 feet in width.

A strong feature of this mineral belt is that there never seems to be barren quartz bodies. The value may go low, and it does in places, but wherever a shoot of quartz exists it is safe to figure on gold value sufficient to pay to mine, while the better-grade ore at times runs up to $100 a ton, and even higher, often showing free gold specimens.

### Development.

On the Surf Inlet property there are two veins, called respectively the east and west veins. The west vein is running at such an angle that we expect it to make a junction with the main vein at some point ahead of our present workings. Both of these veins have been cut to some depth by a small creek, and development of each has been by drifting on the vein from this creek. The wets vein has been drifted on for 150 feet, and the vein cross-cut in several places, proving an ore body from 4 to 10 feet wide, and sometimes containing remarkably high gold value, with an average of about $20 a ton.

At a level of about 150 feet vertically below this work the No. 2 tunnel was driven on the main vein. This drift has just reached the 630 foot mark; it has continued on ore all that distance and has proved a most valuable gold ore body. It has been my practice to drive the tunnel along the footwall side of the vein wholly or partly in ore and then, at intervals of 50 feet cross-cut to the hanging wall.

Throughout all this work the vein is shown to be a perfect type of fissure vein, and to vary in width from 10 to 29 feet. This tunnel attains a depth of 400 feet following the vein. A shaft has been sunk on the vein from the surface to a depth of 50 feet and cross-cut at the bottom shows the width of the vein there to be 18 feet.

At about the 150-foot mark in the tunnel a cross-cut shows the vein to be 16 feet wide, at 350 feet in it is fully 15 feet, at 400 feet the width is 12 feet, at

450 feet, 20 feet, with not less than 10 feet at any place cut up to the 600 foot cross-cut, just completed and showing a width of 20 feet of clean ore. This is the deepest point yet developed in the mine, and the orebody seems to be the largest and containing best average value. Carload samples of ore from this cross-cut run as high as $35 per ton, while the orebody will average about $15 in gold, for the 20 feet. I estimate the average width of this vein at 12 feet, which is easily inside the mark.

At the present time we are pushing the main drift ahead along the ore body and raising to the bottom of the 50 foot shaft, a height from No. 2 tunnel of more than 200 feet. This rise will prove the orebody between the level and bottom of shaft and serve to give air to our workers below.

A cross-cut has been driven from the main tunnel to cut the west vein at this level and prove the ground between. Ore has been encountered, but we are not sure at present whether it is the real vein or not. Some remarkably high value has been obtained, but it is possible the larger orebody has not yet been reached by this cross-cut.

### Orebodies.

While at the 600-foot cross-cut the orebody is large, it is still probable the west vein is somewhere nearby, and in the hanging wall of the altered rock belt, which at this point is probably about 100 feet thick. It is my intention to make a thorough cross-cut to the solid granite by continuing the 600-foot cross-cut, which will prove this point.

The oreshoot is proven to be more than 700 feet long, and the strongest showing developed is the deepest down and farthest into the hill. It is impossible to say how much farther this shoot will continue without a break, but there is no good reason for it to give out for some distance.

On the contrary some of our best surface territory is on ahead, and I believe after machines shall be installed large orebodies will be developed in that direction by following the sheared zone, as we are at present doing with such good results.

The company's ground covers nearly a mile in length along the fault line, all of which will be developed in time, and no doubt the finding of many good oreshoots will be the result.

The present tunnel level is several hundred feet above the creek, so several lower levels can be driven with moderate cost for amount of ore such work would develop.

While it is true that until the rise is completed there is not much ore technically developed, yet with an orebody of this character and proven to be so well defined, much latitude can safely be allowed an engineer in attempting an estimate of ore developed. Presuming that the vein as shown in all the development work is to be a fair average of the ore through to surface, there should be at least 150,000 tons of ore above the No. 2 level. The orebody averages stronger throughout the tunnel than the surface showings, so I think ore figured below this tunnel for a reasonable distance perfectly safe base to reckon on. If you allow the first 100 feet below you have 70,000 tons, making 220,000 tons practically in sight to begin milling on, and this is without bringing the ore in the west vein into the calculation.

Regarding the value, which is all in gold—while some parts of the vein are low there are no barren areas, and to offset the low parts some rich ore occurs. Ore $8 to $10 a ton is most common, and we hope to make a mill-feed average of about $10.

### Ore Treatment.

The treatment of the ore has been given some exhaustive tests during this season. The last test was made on a one ton sample taken from all parts of the orebodies. This was placed in the hands of Mr. C. E. Verrill, an expert mill man of Vancouver. This ore was tested in the works of Messrs. Falkenberg & Lucks, Seattle, Washington. These tests have been perfectly satisfactory, and they have resulted in determining the simplest method of treating the ore and making about the highest saving known on any plant.

The ore contained fully 10 per cent. iron sulphides, in a brittle and clean quartz, which admits of a very clean concentration, but it was found that both the iron sulphides and the quartz sands yielded a higher saving by simple cyaniding. So test swere made of fine grinding the straight ore and cyaniding the whole product. This gave such good results that this simple process has been recommended to the company.

# THE PULMOTOR IN MINE RESCUE WORK.

By Henry E. Bertling.*

The need for an improved substitute for mechanical resuscitation has been felt for a long time, medical practice offering a wide field for such experiments in the frequent cases, for instance, of poisoning by gases, fumes, lysol, etc., drowning, electric shock and the always imminent risk of collapse in narcosis.

For a long period, however, mechanical assistance by means of the human hand has been the only form available in such cases. The hand is, naturally, soon tired, and, while in operation, introduces fresh air only very slowly into the lungs, so that success entails strenuous endeavor continued for hours. When, later on, the almost miraculous action of oxygen on the almost entirely stagnant lungs and heart began to be recognized, the desire for some improved method became all the more urgent, and we are now offered in the Pulmotor, an automatic resuscitation apparatus which renders the healing power of oxygen available in rescue work.

It produces the flow of the inhaled and the exhaled air by a single nozzle, the rhythm of respiration adjusting itself as automatically to the dimensions of the lungs and thus the astonishing result is produced that a seemingly lifeless body begins to breathe regularly, directly the Pulmotor is placed in connection with it.

*Paper presented at Ottawa Meeting, C. M. I.

Of course the apparatus cannot bring any person back from the dead, and no such claim is made for it; if, however, even the slightest trace of blood circulation, through the action of the heart, be present in the apparently lifeless body, the lungs are supplied with oxygen just as in natural respiration, so that the most favourable conditions imaginable for resuscitation are provided. The Pulmotor works directly on the respiratory organs and ,if the spark of life still exists, will fan it into flame and give the heart and lungs a chance to fight their own battle which they will do more valiantly than any mechanism that has ever been invented.

The whole of the apparatus is contained in a case weighing altogether 46 pounds, and is carried easily by one person. Besides the special apparatus for artificial respiration, housed in the case itself, it contains mounted on the lid of the case an oxygen inhalation apparatus for ordinary oxygen inhalation. The two apparatus have in common the oxygen cylinder, and the pressure reducing valve, and either of them can be set in operation simply by turnig a suitably arranged lever to the right or left. The oxygen cylinder is closed by a valve and as soon as this valve is opened, one or other of the apparatus begins to work. The cylinder contains 11½ cubic feet of oxygen and, when full, will keep the Pulmotor in operation for 40 minutes in succession.

The oxygen passes to an injector, which has the property of drawing in a large volume of air which it propels with equal force through the flexible tube in front of the injector, thus alternately filling the lungs by pressure and empting them by suction; the pressure is equivalent to 8-inches water gauge and the suction to 10 inches. Other important parts of the apparatus are the air reversing chamber and a small batter accordion bellows which effects the automatic reversal of the apparatus from suction to delivery and vice versa without ceasing, and which is perhaps the most striking invention of the Pulmotor. The operation of the bellows is extremely simple, it is connected with the air tubes and during inflation, the same pressure obtains in the bellows as in the lungs, but as soon as the latter are filled, the bellows becomes inflated and in moving forward causes the valve to be automatically reversed into position for suction. Then the operation is reversed and as soon as the lungs have been emptied the bellows contracts and automatically reverses the valves again into position for suction and so on. The great advantage is, as may readily be seen, that the respiratory rhythm of the apparatus really adapts itself absolutely automatically to the capacity of the lungs in every case, and that the apparatus performs all these functions, without any assistance being required from the hands. Consequently the whole attention of the operator may be directed to the patient and to the important tasks of keeping the windpipe open and of closing the gullet.

The keeping open of the windpipe is always the most difficult point in artificial respiration, this pipe being, in asphyxiated patients obstructed by the contracted and retracted tongue, and also by the epiglottis. The tongue should therefore be drawn forward in the proper manner, for which purpose a pair of forceps is provided in the case, before attaching the face mask covering mouth and nose of the patient, so as to ensure airtight connection between the Pulmotor tubes and the organs of respiration. The mask is secured to the face by two pairs of straps, which branch from a padded ring that is placed under the back of the head, so effecting a close fit all round.

It is further necessary to prevent any air or oxygen from entering into the gullet, i.e., the passage leading from the mouth to the stomach, as this would risk a distension of the stomach, if the apparatus is used for long at a time. The gullet is a flaccid, muscular tube, lying between the semi-rigid windpipe and the osseous spinal column. Consequently all that is necessary is the application of gentle pressure on the windpipe in the middle of the throat, which will compress the gullet against the spinal column in such a manner as to prevent the passage of air to the stomach, this pressure does not restrict the circulation of air in the semi-rigid windpipe. The accuracy of this reasoning has been proved beyond doubt through very interesting and subtle experiments with a surgical subject undertaken by Professor Dr. Roth, of Lubeck, Germany.

The inhalation apparatus attached to the lid of the case is intended for ordinary oxygen inhalation after artificial respiration has been successfully applied and the sufferer is again able to breathe naturally.

The success of the Pulmotor during the short period since it has been known, has been almost miraculous; it was first introduced to America by the Commonwealth Edison Co., in Chicago, who purchased the apparatus for the benefit of their employees in the frequent cases of electric shocks and at the same time put it at the disposal of the general public. According to their statement the Pulmotor has been called to resuscitate fifty-five persons overcome by poisonous gases in Chicago between January 16 and February 18, 1912. Of these forty-one were revived, four were dead before the apparatus arrived, four attempts at resuscitation were unsuccessful, and the others were not Pulmotor cases. The first call for the apparatus came on January 16. The patient had been overcome by illuminating gas, and when the operator reached the house with the Pulmotor there was just the faintest breath of life preceptible and the pulse was so feeble it could hardly be distinguished. No doctor could be reached and the operator went to work. The response was almost instantaneous and in half an hour the man was breathing naturally.

In another case a physician had already declared the patient dead and told the family there was no possible hope from any source when the Pulmotor arrived. In a few minutes, after the apparatus got to work, the pulse of the man showed great improvement and there were other encouraging signs. The doctor returned to the task, and a few hours later the patient recovered consciousness.

According to the statement of the above company the Pulmotor is practically infallible in cases of asphyxiation, drowning or any poisoning that produces sleep, and electric shocks, as long as there is still any action of the heart left.

The great usefulness of the Pulmotor for all those that work in mines or such establishments that necessitate the handling of chemicals, etc., is obvious, and a great number of mines in the States and in British Columbia are already equipped with Pulmotor.

The special Pullman car, which is used as a portable rescue station in American mining districts is also equipped with a Pulmotor, and it seems only a matter of time until the apparatus will be considered an indispensable part of any rescue station.

# EXTRACTS FROM REPORT OF S. PRICE, LIMITATION OF THE HOURS OF LABOR OF UNDERGROUND WORKMEN IN THE MINES OF ONTARIO

Dear Sir,—Pursuant to your instructions of August 10th, 1912, I have inquired into and considered the matter of legislation for the limitation of the hours of labour of underground workmen in the mines of Ontario and I now beg to make my report.

### Mode and Nature of Investigation.

My investigation has been for the most part informal. I have endeavoured by personal examination and by inquiry from the men and the mine managers to ascertain and understand the nature of underground employment in the mines, and the conditions under which the men work, and to gather what knowledge and information I could as to the effect which an eight hour law would be likely to have upon the mining industry. The fullest opportunity has been given for expression of the views of those chiefly concerned. Public meetings, advertised in the press and by posting up and distributing notices, were held in the most important mining centres and every one interested was invited to be present to make known his views, or to hand in or send me in writing anything he desired to say. The mine owners throughout the province have been communicated with and data collected from them regarding the number of men employed, the present hours of labour, the means of descent and ascent, the time taken for meals or rest and other matters which might have a bearing upon the question in hand. I personally visited a number of the mines in various parts of the province, spent considerable time underground seeing the men at work, and examining the character of their employment and the conditions surrounding it, and conversed with large numbers of the men and with their foremen and employers.

By these means and from petitions and letters, and other statements and material handed or sent to me by the men and the mine managers, by discussion with a large number of them, by taking a secret ballot from the men at a number of the mines, and by consultation with the mine inspectors and other officers of the province, and interviews with other disinterested persons having knowledge of mining affairs, I satisfied myself as fully as I could as to the views and wishes of both parties, and as to the facts and conditions having to do with the matter under inquiry.

I have obtained copies of and perused the eight hour laws in force in other countries, and collected what information I could get regarding their operation and effect.

The reports of Commissions elsewhere upon the eight hour question, and various articles and comment, opinions of political economists and other literature upon the subject, have also had consideration.

### Mine Workmen and Importance of Mining in Ontario.

About 7,700 men in all are employed in and about the mines at which there are underground workings (excluding smelters, concentrators and mills not operated in immediate connection with the mine). Of these 7,700 about 4,000 are underground men, who would be directly affected by the proposed legislation. These 4,000 underground men are distributed among the different mining districts of the province approximately as follows: Cobalt 1,800, Porcupine 440, Sudbury 1,000, Michipicoten 281, Elk Lake and Gowganda 74, Hastings and vicinity 154, Grand River district 57, various places in eastern Ontario 43, and in northwestern Ontario 124, the rest belonging to Swastika, Temagami and eastern Algoma.

There are no statistics as to the men's nationality, but the great majority of them are foreign born, especially in the Sudbury and Michipicoten districts, coming largely from Italy, Finland, Austria and Poland.

In most of the mines the greater number of the men are lodged and boarded by the mining company, being either unmarried or having a family living elsewhere.

The total annual wage list for these mines is over $6,000,000, and if the smelters, concentrators and mills in the province were all included this would add some three or four million dollars more.

It need hardly be pointed out that by reason of this large wage bill and by reason of the great quantity of provisions, machinery and supplies of various kinds used in and about the mines, the province generally reaps great advantage from its mining industry. The enviable position which Ontario now occupies as easily the premier mining province of the Dominion, and one of the great mining districts of the world, is not only a matter to be proud of, but is something that brings substantial benefit to a large part of our population. The farmer, the merchant, the manufacturer, the railway man and many others of various occupations reap advantage from the prosperity of this industry, and all are interested in its welfare.

### Present Hours and Conditions.

The present hours of labour underground vary from 8 to 10 hours, mines which are side by side often differing. Of the 86 mines from which complete returns have been received 40 work 10 hours a day, 32 work 9 hours, 10 work 8 hours, 2 between 8½ and 9 hours and one works 9½ hours. The average for the province would be a little over 9 hours. A number of what are called prospects, not included in the above, work more or less irregularly.

The depth of the mines varies all the way to 1,300 or 1,400 feet, but the great majority of the workings are less than 400 feet and very many of them less than 200 feet deep. In 46 of the mines the means of descent and ascent is by ladder, in 24 by lowering and hoisting of cage, in 13 both means are used, and in 4 entrance is by tunnel or adit. The number of mines using the cage is increasing, but for depths not exceeding 200 feet the ladder seems preferable by reason of being safer, though the men as a rule no doubt generally prefer the cage.

Nearly all the mines in the chief mining districts work two shifts a day—a day and a night shift, each commencing at 7 o'clock morning or evening a sthe case may be and quitting at 6, 5, 4 or 3.30, an hour or less being usually taken for dinner or lunch about the middle of the period. When shafts are being sunk or other work is desired to be specially rushed three shifts a day of 8 hours each are usually put on. It might also be mentioned that for shaft-sinking or other very wet work extra pay is generally allowed. Often the hours are shortened or changed on Saturdays by reason of Sunday intervening or to give a part holiday.

### What the Men Say.

Careful inquiry and test by ballot, where that was considered desirable, satisfies me beyond doubt that the men, under whatever system of pay they are working, are nearly all in favour of an eight hour law. The meetings held at Porcupine and Cobalt which were largely attended, and those at Sudbury, Marmora, Kingston, and elsewhere, at which the attendance was slight, expressed themselves unanimously, so far as the men were concerned, in favour of the eight hour legislation, and this after the matter had been explained and discussed and after the mine manager's statement declaring that it would involve a deduction in pay, had been read to them. Petitions purporting to be signed by a number of men at Elk Lake (not all, however, miners), and by nearly all the underground men of two of the important mines at Sudbury, and resolutions and addresses from the miners' unions, asking and arguing for the law, were presented to me. Owing, however, to statements from the mine managers that many of the men were really not in favour of the eight hour law, but against it, but that they sometimes did not like to say so, I determined to test the matter by distributing a ballot by which the men could express their wishes secretly if they desired. Care was taken to include a number of the mines as to which I was satisfied the relations generally between the owners and the men were good. In nearly all the mines where the ballot was taken I am satisfied that the men as a rule are well treated and not at all dissatisfied in general with the way they are used by their employers. In a number of cases I know a good deal of pains have been taken by the employers to look after the men's welfare. The result of the ballot, however, was to show that even in these cases and in cases where the men did not belong to any miners' organization nearly all the men desired the eight hour law, 332 ballots being returned in favour of it and only 12 against it. Six of the ballots marked for it, however, had the words "with a minimum wage" written upon them, and 3 of those marked against it asked for a 9 hour day. The most significant feature in regard to this ballot was the fact that where the men are paid by the piece and depend for the amount of their pay on the amount of work they can do in a day they are almost as strongly for the law as in the places where the pay is by the day, and before the vote was taken the difference in their position as compared with other places and the effect the proposed law would have in reducing their pay, unless they could do as much work in eight hours as they are now doing in ten, was carefully pointed out and explained to them. As expressed at some of the meetings, the feeling of the men seemed to be "get the law passed anyway and see about the matter of pay afterwards."

The chief grounds urged are as follows: First, the humanitarian aspect — that working underground is working under unnatural and trying conditions, being away from the surface and the sunlight and in air more or less impure and inferior to the natural air, being often contaminated with fumes of gas and with injurious dust or particles from the drilling and other operations. They complain at Cobalt that the hydraulic air used in a large number of the mines there is not as good as the air of the ordinary compressor. It is a frequent occurrence they say in underground mines to have men overcome by gas from the blasting powder and sometimes to lose their lives thereby, and they say headache and sickness from the powder are common. They say that the work is dangerous and a strain on the system, and that the working places are often wet or damp and the work usually strenuous and more exhausting and harder on the constitution than similar work would be on the surface, and that the mining life of an underground miner is short. They claim that eight hours efficient work is all the ordinary man is capable of, and that exhaustion or dulling of faculties causes accidents to be more frequent in the latter part of a long shift. They point to the various other mining countries where the eight hour law is in force, and ask why Ontario should not be as good as these. Some say that a better and more efficient class of men would be induced to come into Ontario if the hours of labour were as favourable as in British Columbia and the Western States. Many say that those who oppose reduction of hours think only of dividends and are willing to sacrifice the health of the men for money.

Most of the men also claim that with proper system and management as much work can be done in eight hours as is now done in nine or ten, and that there would be no decrease in the output of the mines or increase in the cost of production. There will always, they say, be objections made to any change in existing conditions, and they claim that the cries of injury to the industry raised in other places when the law was being put in force there have proved ill-founded.

They urge that the eight hour law should apply to all mines, with no qualification or exemption, except only for cases of emergency where life or property is in imminent danger, and that it would be fatal to the usefulness of the law to exempt contract or piece work or to complicate the Act by special provisions or exemptions.

### What the Mine Managers Say.

The mine managers generally oppose the eight hour law. Less than half a dozen are wholly in favour of it, a few are not strong one way or the other, while others would not object to it if it was made eight hours face to face and not bank to bank and provisions were inserted to meet special conditions and contingencies. Quite a number would have no objection to a nine hour day.

The arguments urged against the adoption of the eight hour legislation are very numerous, but those in which the greater number of its opponents concur are: That it would mean reduction of wages and consequent dissatisfaction of the men; that it would decrease the output and profits of the industry, make low grade propositions unworkable and discourage influx of capital; that the eight hour law has in fact had disastrous effects in British Columbia, Australia, and parts of the United States, and is driving capital and labour out of England and the United States; that the popular belief that underground employment on the present basis is injurious or objectionable is not correct, experience, the hospital records, and the fact that men prefer underground to surface work being appealed to in support of this contention; that legislation upon such a question is not wise, and that it would be inexpedient to disturb existing conditions, which it is claimed are generally satisfactory to the men who are willing to work.

It is also urged that by a large number that, even if such a law were proper or desirable in very large mines or in more advanced stages of the industry, it is not justified in Ontario, where most of the mines are comparatively small and the industry largely in the development stage; and it is pointed out that while some of the mines pay very large dividends many others in different parts of the province have but a slight margin of profit and cannot bear increased expense.

By the Cobalt mine managers it is also urged that they have to compete in silver with Mexico, which has cheaper labour and less expense by reason of a warmer climate; that they have to pay supplementary revenue taxes and some of them royalties, and that freight and other charges are high; that a shorter day would necessitate greater speed and conduce to increase of accidents; that as the time of actual operation of the drills is only 6.45 hours a day, the rest of the 10-hour day being taken up in going to and from work, taking down and setting up drills, blasting, etc., a reduction of two hours in the working day would mean only 4.45 hours of actual drilling, and would therefore cause a reduction of 31 per cent. in the output and in the dividends.

### Operation and Effect of Eight Hour Laws.

In addition to what information I could glean from articles and reports and from interviews with persons having more or less knowledge of conditions in places where eight hour laws are in force, a number of the mine inspectors of British Columbia and of the Western States have been good enough to answer a list of questions which I submitted to them regarding the operation and effect of the law in their country, and to give me their opinion generally as to the expediency of such a law.

Chief Inspector Graham, of British Columbia, where the eight hour law has been for a long time in force, thinks it increased the cost of mining slightly, but very slightly, but that it does not decrease the output, though it may mean a reorganization of the working forces. He says the men unanimously and the operators generally favour its existence, and that instead of being injurious it is beneficial to the mining industry. He is decidedly in favour of having such a law. Inspector Strachan, of the Nicola Valley district, gives answers generally much to the same effect, but thinks the law does not increase the cost of operating, and believes the eight hour day is better for the company financially, and he says he has found none of the operators now desiring to have the day longer than eight hours, and he is even more strongly in favour of the eight hour law than the Chief Inspector. The inspector of the West Kootenay district thinks the eight hour law does decrease the output, but does not think it is injurious to mining industries, and thinks an eight hour law in mining is desirable.

Mr. Henahen, Commissioner of Mines, Colorado, where the eight hour law has been in force since 1904, thinks the law does not raise the cost of operating and that such a law is desirable in mining. He says the workmen favour it, and that the metalliferous mine operators generally favour it also. Mr. Bartholomew, Secretary of the Bureau of Mines, Missouri, which has had the eight hour law since 1899, is not prepared to answer as to the effect of the law on the output, but says the men and the operators generally favour its existence, and that he thinks it is desirable to have such a law. Inspector Walsh, of Montana, where the eight hour law came into force in 1907, does not think it raises the cost of operating and says that the men, and in most cases the operators, favour its existence, and his opinion is that the law is desirable in mining. Inspetcor Jones, of Wyoming, says the eight hour law raises the cost of operating at first, but thinks, with proper adjustments to meet the altered conditions, this can be more than offset. He says the men favour its existence, but that the operators are not favourable to outside regulation. He thinks the law is desirable. State Inspector Bell, of Idaho, thinks the eight hour law raises the cost of operating proportionately and decreases the output of the mine, but the men and most of the operators favour its existence, and he thinks such a law is desirable in mining. State Mineralogist Storms, of California, where the eight hour law has been in force since 1909, thinks it raises the operating tonnage cost and undoubtedly decreases the output. He says the men generally favour its existence, but some of the operators are opposed to it. He thinks, generally speaking, such a law is desirable in mining.

Mr. Sutherland (now Assistant Inspector of Mines in Ontario), who has had extensive practical experience in a number of the mining districts of the west, says the men and he thinks, generally, the operators favour the existence of the eight hour law where it is in force, and he thinks it does not decrease the output of the mines and that it is not injurious to the mining industry.

As to the operation and effect of the eight hour law in England, where it went into force in 1909 and 1910, all the information I have obtained has been derived from the inspectors' official reports and from information which Sir George Askwith, of the Industrial Commissioner's Department, has been kind enough to give me. It seems that owing to the customs and privileges which had grown up in different parts of the country some friction occurred at first as to a number of matters, but the law seems now to be working pretty smoothly. The comparatively short time it has been in force and the other labour disturbances that have occurred and the changes that have been made in other respects make it difficult to tell what are its effects. It does not appear to have decreased the output, but the chief inspector, while thinking there has been an increase in the working cost per ton, says it is impossible to say how far this is due to the operation of the "Eight Hours" Act. On the whole it would not appear that any very material economic effects are attributed to the operation of the law.

### Independent Opinion in Ontario.

I have discussed the question of an eight hour law very fully with our own mine inspectors and other officials and with other disinterested persons familiar with mining conditions. The inspectors, whose efficiency and usefulness I found in my visits to the mines to be held in high respect both by the operators and the men, naturally and properly do not wish unduly to take part in any controversy between the two parties, but their knowledge and experience in these matters and the opportunities they have had for understanding circumstances and conditions are such that it seemed to me imperative to obtain the benefit of their knowledge and that I have consulted them; some of the information they have given me upon these is more particularly referred to in other parts of the report, but I think it is right to say here that they and the other mining officials with whom I have discusesd the eight hour day do not seem to fear evil results from it, and Inspector Sutherland is very strong in the belief that a reasonable eight hour law for underground workers would be beneficial.

I think the weight of well-informed independent opinion is in favour of the law.

### Review of the Matter.

From what has already been stated I think it must be concluded that foreboding of disastrous results to the mining industry if an eight hour bill is enacted are not justified. The mine managers do not produce any figures or evidence in support of their prediction that injury would result, except statements of a number of mining men who attribute their financial difficulties in whole or in part to the eight hour law, and a reference to the closing down of a number of mines in British Columbia after the eight hour bill went into effect. Other opinions, however, do not attribute these things to the reduction of the hours of labour. Inspector Sutherland and others think the trouble in British Columbia was due to other causes, and it may be pointed out that returns indicate that the past year's mining operations in British Columbia have been the most profitable in the history of the province. The strongest support I have found in favour of the contention that the mining industry would be injured is the refusal of the Commission on Hours of Labour in Nova Scotia in 1910, to recommend the eight hour day for the coal miners because they believed such a law would undoubtedly add to the cost of operating or seriously reduce wages, and because apparently they feared injury would in consequence result to the coal industry, which as they pointed out had to meet competition from other places.

In the British coal mines the average hours of labour prior to the enactment of the eight hour law were about the same as we now have in Ontario, and the Commission dealt pretty fully with the matter of reduction of output which the owners claimed wolud result, and arrived at the conclusion that this would not be so great as claimed though they believed some diminution of production would follow. The actual effects, as already pointed out, seem at least no worse than the Commission anticipated.

With regard to the figures as to drill time submitted by the Cobalt Mine Managers, and the contention based thereon, which is very similar to what was urged by the coal mine operators in Great Britain, I am told by independent persons having knowledge of these matters that there is no reason why the actual drill time should not be a good deal longer than the contention indicates. I am informed also that it is claimed by the managers of the mines in Ontario which are working on an eight or a nine hour basis that their costs are as low as those of ten hour mines, and western shiftbosses and mine captains working in the Ontario mines claim that they can get as much work done in eight hours as in ten. It is stated and admitted on nearly all sides that the amount of work done generally in the Ontario mines is not satisfactory for the time that is spent at it, and that in fact the efficiency of a great many of the men is not as high as it should be.

What the effect of the enactment of an eight hour law would really be on one of course can definitely say. As pointed out in the report of the Miners' Eight Hour Day Committee in Great Britain in 1907, much would likely depend on the spirit in which the law was received and the efforts made to adapt operations to the new conditions, and to minimize friction between the men and the employers. Probably upon the whole the conclusion that would be most warranted is that while results might vary in different places or under different circumstances and while there might probably, generally speaking, be some increase in cost of production, the increase which may reasonably be feared is slight.

The fact that little or no injury would likely result to the industry or that the mine owners are able to stand a diminution of profits is no ground for a change or disturbance of conditions unless other reasons warrant or require it. Neither on the other hand I think would even material decrease in output and profits be reason for refusing the law if the conditions in regard to the health and welfare of the workers were so serious as imperatively to require it.

Turing to the latter question, I am convinced that the popular idea of hardship and injuriousness of working underground is only partly right. The mines of Ontario, I believe, as a whole, are naturally as healthful as any in the world. Figures and opinions show that there is little in the assertions regarding arsenic poisoning in the Cobalt mines, though, no doubt, through infection, that does in a few instances occur. There seems, however, to be better basis for the fear of harm arising from the breathing of the dust caused by the drilling and other operations, and especially from the hammer drills where no water is used to allay the dust, and particularly in the quartz workings. Phthisis or miners' consumption is at present a disease little known in Ontario, but the time has been short for its development and it is undoubtedly a matter to be considered and as far as possible guarded against. Our inspectors are fully alive to this necessity and no doubt will do their best to minimize the evil, but I may here mention that one of their difficulties is that the men are not always as willing as they should be to co-operate in precautionary measures. It is undoubtedly true that there is a good deal of powder gas in many of our mines and that this causes considerable trouble, and is more or less harmful even where the men are not actually overcome by it and no fatality occurs thereby. I think it cannot be questioned either that underground mining though not the most hazardous of occupations, must be distinctly classed as a hazardous one. The allegation of greater frequency of accidents in the latter hours of shifts I find after very careful investigation, assisted by the hospital records and other figures produced by the managers, and especially by the data put together for me by Chief Inspector Corkill, is not borne out by the facts. The figures really show that a rather larger percentage of the accidents take place during the early hours of the shift than during the later hours. Reports and opinions do not on the other hand confirm the allegation that shorter hours and consequent speeding up would be likely to increase accidents. Hospital records do not show a large percentage of sickness among the miners. The Commissioners in the British eight hour day report already mentioned, find that the health and physique of coal miners in Great Britain compares favourably with that of other work people, although the eight hour law was in fact adopted there. The best information I have been able to get shows metalliferous mines as a class to be generally less healthful than coal mines.

The prevailing view expressed in the reports received from the inspectors and other officials of British Columbia and the Western States, is that in their opinion underground work is more injurious to the health than surface work, and that there are special reasons why underground men should have shorter hours than other workmen. The eight hour mining laws, as a rule at least, seem to be based upon that assumption, some of the United States statutes specifically so declaring. I am not unmindful in considering the above reports that officials will naturally be disposed to favour their own law, and that the employers whose opinions they refer to in support of the law may not feel disposed to complain of what they cannot help; nor do I forget that the exigency of the situation in the United States from a constitutional point of view may have something to do with the legislative declarations as to the injuriousness and danger of underground employment. Neither do I neglect what is said by the mine managers here, which I think is to a great extent true, that men after getting used to working underground prefer that to surface work; but higher wages and a certain fascination about it, and a sense of pride o rdignity in having attained to a higher or more important stage in the mining occupation, probably account largely for the preference. Whatever the reason may be such a preference is not incompatible with the statement that the occupation is in fact unhealthful and injurious.

Undoubtedly the air in mines even under favourable conditions is not as good as ordinary air. It contains a smaller percentage of oxygen (especially where hydraulic air is used), is more or less laden with dust or small particles of rock or mineral and with powder gas—the prevalence of which, however, varies very greatly in different cases—and as natural ventilation is always poor other impurities also are pretty sure to be present. There is besides usually more or less water or dampness underground, though our inspectors say that as a class the Ontario mines would be considered dry in comparison with others. Working under these conditions, and always by artificial light, I think cannot reasonably be contended to be as good for the worker as working under ordinary conditions, and the element of danger may add something to the burden. It is estimated that 80 per cent. of the underground men are under 40 years of age and 90 per cent. under 50.

Upon consideration of everything I have been able to gather I think the conclusion must be that working underground is unhealthful and injurious, though not at all to as great an extent as is claimed by a number of the men or as is ordinarily believed by persons unfamiliar with mining conditions.

Some of the statements put forward as arguments for or against the law are not relevant. That the workmen have among them persons who favour the law upon grounds that do not commend themselves to the general community, or that they have in their ranks or in the organization to which a number of them belong, individuals who are not a credit to them, should not condemn their case if it is in fact meritorious; though I think the importance to any body of men of so controlling their members as to maintain public opinion upon their side can hardly be over-estimated. I should be sorry on the other hand to see any law put in force for no better reason than that those upon whom it may be assumed to be a burden are making large profits and are well able to bear it, even where that is the case. The prevailing idea, however, that the mine owner gets his money easily is far from being always correct. While some of the mines may return investment a hundred fold and be almost able to pay their last year's wagebill from the mere advance in the price of their product, there are many where profits are very much smaller, and some where more money goes in than ever comes out. I have sometimes felt that the mine owners of Ontario have not always had the sympathy that they should have from the rest of the population, but objections on the ground of taxation and royalties, which have no relevancy in the present inquiry and which can only be regarded as complaints against what the people of the province generally regard as just and reasonable, can hardly be hoped to enlist public opinion in their faour. But this is beside the question.

A consideration which I think should have weight is the tendency the proposed legislation would likely have toward allaying unrest and removing friction and difficulty existing in a number of the mining camps. Taking out of the field of controversy and settling permanently what has been and will apparently likely otherwise continue to be a fruitful source of trouble between the employers and the men would of itself be a good deal gained. Sir George Askwith, speaking of the question generally, and Inspector Sutherland, speaking of conditions in Ontario particularly, are both of opinion that the eight hour day will likely come sooner or later, or will be a source of agitation until it is obtained, and they both see advantages in establishing it now. The history of the matter in Ontario supports this view. There has been a gradual reduction in the length of the day in a number of the mining districts. The newer camp at Porcupine has, on the whole, considerably shorter hours than Cobalt, and lately the shorter day has been introduced in some of the mines in the older districts. As already mentioned, it is not only the miners' organizations that are wanting the shorter day, but also the men who neither belong to the union nor live in districts where unions exist, and those working by piece work or contract, as well as those working for day wages. This desire of the men for the law, I think, is an important consideration in estimating its desirability. It cannot, of course, be hoped that the legislation would settle all difficulties and wholly prevent strikes, but it would remove one of the chief causes of trouble.

I think there is something, too, in the contention that the shorter day would tend to greater skill and efficiency of the men, and that by improving conditions it would encourage a more permanent class of residents in the mining camps and lessen the very large remittances of wages now sent out of the country by those having no established home here.

### Recommendations.

Everything considered, I think the balance is in favour of enacting a reasonable eight hour law for underground workmen in the mines of Ontario.

Of the laws in force in other places, I think that in Great Britain is the most carefully devised, and that its principles should, in the main, be followed, with simplification of some of its provisions where that is possible.

Subject to proper safeguards for securing suitable means of descent and ascent, I would recommend that the law respecting metalliferous mines in British Columbia, and that in force in most of the Western United States, approximating closely in this respect to the laws of Great Britain and France, should be followed as to mkaing the eight hours from face to face rather from bank to bank.

The law, I think, should apply to contract and piece work, as well as work by the day, and men as well as employers should be obliged to observe it, notwithstanding any consent or agreement between them; otherwise I think the chief benefit of the law would be lost.

I think no overtime or deviation from the Act should be permitted except in emergencies where life or property is in danger and for repair work and an exception for Saturdays; but I think pumpmen and shiftbosses and persons engaged solely in surveying or measuring might properly be excepted from its provisions, and I think, having in view the conditions now prevailing at a number of the mines, the time taken for dinner or lunch, not exceeding half or at most three-quarters of an hour, should be excluded, and I do not think the usefulness of the Act would be materially impaired by exempting workings where not more than six men are employed in a shift. Very strong representations have been made to me in respect of the hardship an inelastic eight hour law might entail in performance of development work, especially in out of the way districts, and I think this exemption might safely be conceded.

I would suggest that the mine managers, in order to be permitted to exclude the time taken in descending and ascending, should be required to obtain from the mine inspector a certificate that the means provided for descent and ascent are satisfactory. I think also the question as to whether a shift is in fact composed of not more than six men should, in case of dispute, be determined by the mine inspector.

In answer to a question asked, I would say I do not think it would be desirable that, instead of enacting a positive eight hour law, the fixing of the hours of labour should be left with a Board. That, I think, would be sure to cause trouble, and would destroy one of the chief benefits I see in passing the legislation.

I can see no harm in inserting a provision such as the British and Alberta Acts contain, empowering suspension of the law by Order-in-Council in the event of great emergency or grave economic disturbance.

The provision in the British Act allowing an extra hour during periods not exceeding 60 days in the year is, I think, unnecessary here, and would only tend to cause complication.

Following the course pursued in the enactment of similar laws in a number of other places, I think, in order to permit of preparation for it, the coming into effect of the Act should be postponed for a reasonable time—not less than six months—from its passing, and, perhaps, it would be but fair to postpone it longer in respect of the mines or the district where there have recently been strikes, as it might be considered a hardship upon the mines which, according to the findings of the Arbitration Board, have not been in the wrong, to disturb conditions again after so short an interval.

Faithfully submitted,

S. PRICE.

St. Thomas, Ont., January 27, 1913.

# PRINCIPLES ON MINE VALUATION.*

By James R. Finlay.

Almost all enterprise is based on valuation of some kind. Practically all transactions in mining property, whether it be in stocks, bonds, or actual ownership, are based on some kind of an appraisal of values. If you expect to be employers instead of employees you should begin at once to study the factors which give value to things. You can not buy intelligently nor sell intelligently until you know how to form an estimate of what a given property is worth to you, to the man you are dealing with, and to anyone else who might be brought in. It is only by such knowledge that one can discern a bargain or avoid a disastrous venture.

This generalization has no more application to mining than to any other form of business; but it certainly does not apply to mining less than to other forms of business. I think that no more unfortunate idea is taught to young mining engineers than that they are to consider themselves merely as professional men, like doctors or ministers. I would not speak of this if such an idea had not been cultivated in certain quarters. It is true that some mining engineers are employed to do technical work as referees between conflicting interests. Professional honesty is of course an absolute essential, but the honesty of a mining engineer is the honesty of business and of common sense. It is not in the least desirable for a mining engineer to avoid business transactions; on the contrary he should go into them as soon as possible and study the subject in every possible way. I do not see how any man can make a success of mining who does not realize that it is a strictly commercial business; that the only result to be sought is commercial success; that the only scientific and technical attainments that are worth anything are those which contribute to commercial success. Attainments of a different character are, of course, worth while; but they are valuable to a mining engineer because he is a man and a citizen, not because he is a mining engineer. They would be equally valuable in every kind of profession. Success in business is measured in money. Technical skill is efficient only if it pays. One can judge of the value of technical excellence only if he is prepared with a knowledge of what constitutes the money value of the results of such technical excellence.

Undoubtedly this view of the mining business, or pro fession, has been gaining ground in our universities and technical schools. Formerly, I think, education was considered to be merely a training in principles. Technical training was a discipline in the science of action (I coin the expression), an exposition of the principles of doing things. Whether it was worth while, in dollars and cents, to do a thing was to be found out later in actual business. Now I think it is recognized that, while making money is of course a matter of actual occupation in business, there are certain general principles underlying the value of things, which are well worth study. This is the study of political economy, which is largely taught in all our universities. The mining engineer sooner or later comes into contact with this subject and is bound to find it interesting and important. I shall try now to advance a few ideas about the valuation of mines, which I think are basic enough to come under the head of general principles.

The first thing to which I wish to draw your attention is the general subject of valuation. What is it that causes a price to be fixed for commodities or properties? In general, there are two methods of fixing values; one is the empirical method, and the other, the constructive. The empirical method of fixing values is simply to obtain a record of facts—of transactions. A man will assume that a town lot is worth $100 because he finds that people have bought and sold similar lots for $100 apiece. Nearly all commodities of a retail nature are valued in that way, and it is perfectly logical that they should be, because each actual transfer is a bargain between the buyer and the seller, the-

*A lecture in the Department of Mining, Columbia University, December 2nd, 1912.

oretically at least. The man who sells for a certain price does so because he believes he can do it profitably. On the other hand, the man who buys figures the same way from his side. Consequently we find that wheat, iron and copper, as commodities, are valued empirically by merely ascertaining what sales are made; and fluctuations of price are established by supply and demand. If a commodity is anxiously sought for by more people than can be supplied, they bid up the price.

The constructive method is that which places the value of commodities in a more or less scientific manner—builds up logically an estimate of what it properly should be worth. This naturally applies to properties which are dealt in only occasionally, for which there is no precedent of an actual sale of the equivalent thing. You will easily see that mines belong to that class of property.

Hardly any two mines are exactly alike; therefore you cannot say logically that because one mine is worth one million dollars, another mine is also worth one million dollars—at least you cannot say so until you have gone through the factors which give both properties value, and have found that they are identical. It is to those factors which do give values to mines that I wish to call your attention now.

(To be continued)

# PERSONAL AND GENERAL

Mr. Alex. H. Smith, of Carter & Smith, has quite recovered from the painful accident that he suffered some weeks ago in Porcupine, and has left for Arizona, after completing several examinations in Eastern Ontario.

Mr. Geo. H. Aylard, now of Victoria, B.C., under whose supervision the Standard silver-lead mine, in Four-mile camp, Slocan Lake district, was developed from a mere prospect to an important ore producer, is spending a few weeks at Silverton and New Denver, within a few miles of the Standard.

Mr. G. O. Buchanan, of Kaslo, B.C., Dominion Supervisor of Lead Bounties, has lately been fully occupied getting in returns of lead mined and smelted in British Columbia, to the close of the fiscal year ended March 31.

Mr. W. A. Carlyle, who in the nineties was actively associated with mining in British Columbia following several years as Professor of Mining and Metallurgy at McGill University, and later was general manager of the Rio Tinto copper mines, in Spain, has resigned the professorship of metallurgy in the Royal School of Mines, London. His resignation is to take effect in June, after which he will resume practice as a consulting engineer, entering into partnership with Mr. John F. Allan, a well-known consulting engineer who, beside important consulting connections, has been in the service at different periods in a managerial capacity, of the Rio Tinto Co., Mexican G. and S. Recovery Co., and Caucasus Copper Co., respectively.

Mr. A. B. Clabon, of Vancouver, B.C., who with Mr. Fred M. Wells has been actively associated during the last year or more with the development of the property on Princess Royal Island of the Surf Inlet Gold Mines Co., is arranging for a resumption of work on the Kingston property, in Hedley camp, Similkameen.

Mr. W. B. Dornberg, of Spokane, Washington, manager for the Treasure Mountain Silver-Lead Co., (which is developing a promising silver-lead property situated in Tulameen district and is distant from Otter Flat, B.C., about 20 miles), has been spending a week in Victoria.

Mr. Howard W. DuBois, of Philadelphia, Penn., managing director of the Quesnelle Hydraulic Gold Mining Co., is making preparations for the ensuing gravel washing season's hydrauliking operations at the company's placer gold mine in Quesnel mining division, Cariboo district, B.C. Mr. DuBois gave the annual meeting of the Canadian Mining Institute at Ottawa last March an interesting account of what his company had done in Cariboo, and showed a number of lantern slides illustrative of its work.

Mr. S. S. Fowler, of Riondel, Kootenay Lake, B.C., general manager for the New Canadian Metal Co., operating the Bluebell lead mine, the first lode mine discovered in British Columbia, spent several days at Victoria about the middle of April.

Mr. Hamilton, for some time in charge of the Cerre de Pasco Mining Co.'s reduction works at La Fundicion, near Tinhauarca, Junin, Peru, has succeeded Mr. A. B. W. Hodges as general manager for the company. La Fundicion will still be his headquarters.

Mr. Lionel Hill, assistant to the manager of the mines of the le Roi No. 2, Ltd., at Rossland, has left British Columbia on a three months' trip to England.

Mr. C. Hankel, formerly with the Zinc Corporation, who for about a year had been advising Mr. M. S. Davys, managing director of the Silverton Mines, Ltd., in connection with the designing of a concentrating plant to treat silver-zinc ore, from that company's Hewitt-Lorna Doone mines, in Silverton camp, near Slocan Lake, and the erection and equipment of a concentrating mill, has left British Columbia on his return to England.

Mr. John Hopp is back in British Columbia from a business trip to Eastern Canadian and United States cities. As the hydraulicking season is approaching, he will shortly prepare for operating. The snowfall having been heavy during the 1912-1913 winter, a long and profitable gravel washing run is expected this year. Mr. Hopp has four or five hydraulic placer-gold mines, situated within a few miles of Barkerville, Carbioo district, including leases on the famous Williams creek and on tributaries of the equally well-known Lightning Creek.

Mr. P. F .Horton, superintendent of the H. B. mine on Deer Creek, near Salmo, Nelson mining division of British Columbia, has been spending a month in Victoria and other coast cities. With the breaking up of the snow road and the unsuitable conditions for heavy hauling in early spring, shipment of ore has had to be temporarily suspended, but as soon as the wagon road shall be hard enough freighting will be resumed. The output capacity of the H. B., which ships lead ore to Trail, is now about 1,000 tons a month.

Mr. H. M. Lancaster, who ten to twelve years ago was engaged in mining engineering work in Rossland camp, and who since 1903 has been connected with mining in the states of Idaho, Montana and Washington, has returned to Rossland with the intention of again giving his attention to mining in British Columbia.

Captain J. Edwards Leckie, formerly of Cobalt, but now of Vancouver, B.C., recently gave an address on "Cobalt and Northern Ontario" before the local Chamber of Mines.

Mr. Duncan McIntosh, of Greenwood, Boundary district, B.C., long connected with the development of mining properties in that district, has been in Vancouver and Victoria for several weeks.

Mr. Robert McKee, after whom McKee Creek, in Atlin camp, was named, was reported in coast newspapers to have been in Seattle early in April with about $400 worth of placer gold from the Silver Creek diggings, situated in the northeastern part of Atlin mining division. Many placer claims have been staked on Silver and other creeks south of Teslin Lake, during the winter, and much work will be done this spring to test the value of the new diggings.

Mr. J. L. Parker, formerly manager of the Pacific Metal Mines Co., of Vancouver, B.C., is now manager of a coal mine near Diamond City, near Lethbridge, Alberta.

Mr. and Mrs. Bedford McNeil will be the guests of Mr. J. B. Tyrrell during the Toronto meeting of the International Geological Congress. Mr. McNeil is president of the Institution of Mining and Metallurgy.

Mr. Hallett R. Robbins, at one time engaged in development work on a group of mineral claims situated in Hedley camp, Similkameen, British Columbia, and afterward practising as a mining engineer, with office in Seattle, Washington, is now assistant professor of metallurgy at the State College of Washington, Pullman, Wash., in succession to the late Mr. Roswell E. Sampson, who was killed by a railway train.

Mr. T. A. Rickard, of London, editor of The Mining Magazine, has been elected a corresponding member of The Canadian Mining Institute.

Mr. J. M. Ruffner, manager of the North Columbia Gold Mining Co., which is the largest operator of hydraulic placer-gold mines in Atlin camp, British Columbia, has returned to that province after having spent the latter part of the winter at his home in Cincinatti, Ohio.

Mr. W. J. Watson, of Ladysmith, Vancouver Island, B.C., manager for the Tyee Copper Co., has gone to England to confer with the directors of the company relative to a possible sale of the Tyee smelting works at Ladysmith, there not being at present a sufficiently large supply of custom ore obtainable to make it probable the company will soon be in a position to resume smelting operations at the works.

Mr. E. H. Webster, assistant manager for the Motherlode Sheep Creek Mining Co., operating a gold mine and 10-stamp mill in Sheep Creek camp, Nelson mining division, B.C., has resigned that position to return to Los Angeles, California.

Mr. Fred M. Wells returned to Vancouver, B.C., on April 14 from Surf Inlet, Princess Royal Island, where he had been developing a gold mine.

Mr. Walter A. Bell, of St. Thomas, has won the Dana Fellowship in geology at Yale University. Mr. Bell is a graduate of Queen's University, where he studied under Professor M. B. Baker.

Mr. S. N. Graham, manager of Peterson Lake mine, recently visited Kingston, Ont.

Mr. Charles Heys, of Thos. Heys and Sons, has returned from a long visit to Nicaragua.

Mr. George R. Rogers, manager of the Mann mine, Gowganda, has returned to the mine after spending some time in Toronto.

Dr. A. Strachan, accompanied by Mrs. Strachan, will attend the meetings of the International Geological Congress as official representative of the British Government. Dr. Strachan is Assistant-Director of the Geological Survey of Great Britain.

# SPECIAL CORRESPONDENCE

## NOVA SCOTIA

### ST. LAWRENCE NAVIGATION.

The opening of navigation for St. Lawrence ports will be unusually early this year. Up to the fifteenth of April the Dominion Coal Company had sent three steamers with coal to Quebec, and shipments should continue regularly from this on. This is at least three weeks earlier than the first shipments in 1912, and the lead gained should be of great assistance in sending the necessary quantity of coal to St. Lawrence ports during the coming summer. It may be confidently expected that shipments up the river during the ensuing season will be greater than in any previous season. The mines have worked without interruption throughout the winter months, and the stockpiles are unusually heavy.

Some recent remarks of Prof. Barnes, of McGill University, have set people thinking as to whether all is being done that it is possible to do to lengthen the period of open navigation in the St. Lawrence River. The question is one which interests the coal trade of Cape Breton more than any other single industry, as probably the greatest problem at the Cape Breton mines is to equalize summer and winter conditions. Prof. Barnes states his belief that a proper service of ice-breakers, such as are used in the Baltic, could keep open a passage from Anticosti to Quebec during the greater portion of the winter, and that with the provision of anchorages for use at night and in snowstorms it would be possible to send vessels to Quebec from the ocean all through the winter. It is certain that in the winter just passed navigation to Quebec was possible until some time in January. The real hindrance to Cape Breton shipping comes in the drift ice season, which covers the months of March and April, and in late springs, even the month of May. The thickness and compactness of the drift icefields varies with the prevailing winds, and sometimes the icefields blockade the Newfoundland shore, and sometimes the Cape

Breton shore. Until the icefields commence to come down from the north there is no hindrance to shipping from Cape Breton ports except the inclemency of the weather and the storms of winter, and it must be said that these are not allowed to interfere very much with business in Cape Breton. If it were possible to bring about the conditions which Prof. Barnes thinks are not impossible then it would enable the Cape Breton mines to ship coal to Quebec all the year round, with the exception of the drift ice period. It must, of course, be borne in mind that the winter of 1912-1913 was a phenomenal one in many respects, and that the temperature in the River St. Lawrence falls extremely low in January and February. Long continued and blinding snow storms have also to be reckoned with.

### DOMINION COAL OUTPUTS.

The output of the Glace Bay mines for March was 370,916 tons, making a total for the first quarter of 1,092,196 tons, compared with 964,525 tons for the first quarter of 1912. The Springhill production was 36,000 tons, the total for the first quarter being 98,579 tons, compared with 107,420 tons for the same period of last year. The reduction in output at Springhill is, of course, due to the fire in the mine which took place around New Years. This difficulty has been overcome, the March output being about 3,000 tons in excess of last March. The net increase from the Dominion Company's mines for the first quarter compared with last year amounts to 118,830 tons. In April the Glace Bay mines will likely produce around 405,000 tons, or 25,000 more than last April. Shipments will not be quite so heavy in this month as last year, when it will be remembered the Cape Breton mines were sending many cargoes of coal to replace English orders because of the English coal strike.

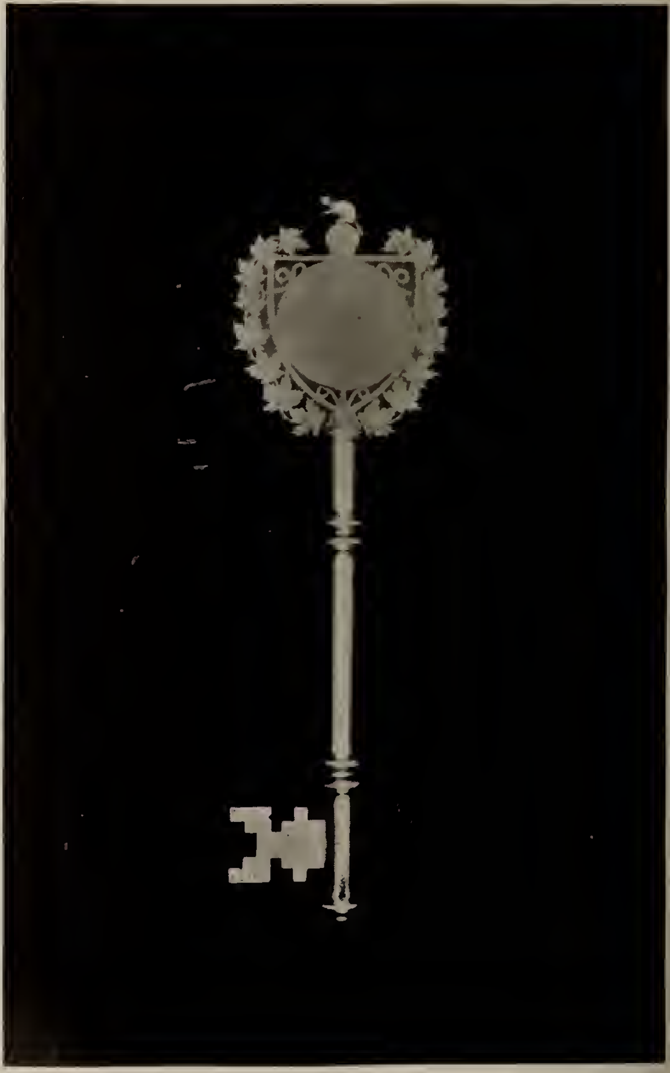
The Emery seam at No. 3 Colliery was pumped out towards the end of March, and a small daily output is now being obtained, which will rapidly increase to two or three hundred tons per day before the end of the summer. This mine is to be known as No. 11 Colliery. It is situated quite near to the surface works of No. 3 Colliery, a mine on the Phalen Seam approaching exhaustion. The opening of the Emery Seam will enable the company to utilize the existing plant and workmen's houses. It may be expected that this procedure will eventually be followed at all the company's mines on the upper seams. Up to the present, with the exception of two openings on the Emery Seam, the lower seams have been left untouched. Below the phalen Seam are the Emery and Gardiner Seams, each of them averaging between four and five feet of good coal, and with roof conditions eminently suited for the longwall method of extraction. Below these two seams are several others, not yet thought of as very attractive seams, but destined some day to be valuable. There are seams of coal in the Sydney Coalfield, as yet despised and disregarded which placed in some of the more exhausted coalfields of the world would be highly thought of. The coal from the Emery Seam it may be remarked is an excellent steam coal. It is a rather dull coal in appearance, having a long "reed" and is fairly strong in texture. It contains a rather larfer percentage of ash than the Phalen Seam, but in burning the coal does not clinker and the ash residue is light in texture and does not clog the draft. The sulphur percentage is low, and the heat units approach those of the Phalen seam. The volatile is comparatively low, and in every respect the Emery coal fulfills the requirements of a steam coal, and for this purpose it will steadily grow in favour when its merits come to be realized.

The unwatering of No. 17 Colliery is proceeding as quickly as possible. The railway connection will be put through during the coming summer, but it is not likely that any output will be obtained until late in the autumn. For the shipping season of 1914 this mine should prove an important producer.

# ONTARIO

### COBALT, SOUTH LORRAIN, GOWGANDA, AND ELK LAKE.

The last obstacle to the pumping out of Kerr Lake has been removed in the sale of the Drummond mine to Mr. David Fasken, and through him it is understood to other parties. One of the stipulations in that sale was that the riiparian rights of Kerr Lake should be sold to the Crown Reserve and the Kerr Lake for $250,000 so that cuts down the net price of the old mine to $250,000, which in the greatly improved condition of it is considered not too high, as there is no small amount of ore actually blocked out.



**Gold Key presented to Mr. Englehart, Chairman T.N.O. Ry., on the completion of the Elk Lake Branch.**

It is probable that Kerr Lake will be pumped out. All that is necessary now under the new clause in the mining act is for the companies to apply to the Mining Commissioner and get his permission to go ahead with the work after he has given his decision.

Plans are being quickly matured also to drain Cobalt Lake, bought from the government five years ago for over a million dollars. The company has twice driven into an open seam and been obliged to seal up for years some of their richest ore. Now they are rapidly preparing to put electric pumps on scows which will drain off the water into Farr Creek and into Lake Temiskaming. The lake is about three-quarters of a mile long and will probably average fifty feet deep so that the task will be of considerable duration. It is in fact estimated that it will take from four to five months steady pumping to lower the water to its required level. At the south or McKinley-Darragh end of the lake a dam will be thrown across the small creek leading into Little Lake and so into Bass Lake and Mud Lake. Enough water can be stored in this way to maintain the requirements of all the steam plants on the lake, it is anticipated. The task is naturally arousing considerable curiosity in the camp.

During the month of March the Nipissing mined ore of an estimated net value of $234,530, and shipped ore of an estimated net value of $204,910. At 63 shaft, which was put down on the old Meyer vein the most favourable development during the month was on the Little Silver vein. The raise was started from the 145-foot level to connect with the bottom of the old workings a hundred feet deep. The location of this raise was at a barren place in the vein, but after raising twenty feet ore was encountered which has averaged three thousand ounces over a width of two inches for forty feet. At a height of fifty feet the vein has become low grade. As soon as the ventilation is obtained by connecting with the Little Silver shaft other raises will be started on and also connect with vein 67, which shows one inch of two thousand ounce ore for sixty feet at the sixty-foot level. At No. 8 shaft crosscutting at the 125-foot level has encountered several small seams of no value. Drifting on one of these which runs in the direction of the surface open cut has now been commenced. This open cut produced a small tonnage of high grade ore from a vein which averaged eight inches wide. This formation both at the surface and at the level is lamprohyre, a keewatin rock. This is the first work done in the formation. The high grade mill treated 113 tons of ore and shipped 313,318 ounces of fine silver. The low grade mill treated 6,233 tons during the month.

The Trethewey production for the first quarter of the year was 150,000 ounces. This was a falling off in comparison with previous quarters due to the fact that during one week in February the mill was closed down on account of repairs which lessened the production. Had not the work at the mill delayed work the silver ounces would have been increased by upwards of 10,000 ounces. During the month of March the output was over 60,000 ounces of silver.

The McKinley-Darragh-Savage production for the first quarter of the year was 430,923 ounces. Of this the Savage contributed but 50,000 ounces. The Savage by months has only been from 17,000 to 25,000 ounces owing to the fact that no more ore is being thrown on the dump than is possible until the addition to the mill at the McKinley-Darragh mill has been completed. Then the low grade will go direct over aerial tramway to it and the production of the Savage will be doubled at once.

The figures for the Cobalt Townsite Mining Company for the first half of April are 80,900 ounces. For the week ending April 12 the amount of silver ounces produced was 40,400 ounces. This compares with 40,500 ounces for the previous week.

A strike of importance to the camp in general and to the mines in South-Eastern Coleman in particular was made at the Beaver Consolidated at the 700-foot level recently. The vein entirely in the diabase is three inches wide and of very high grade ore. Previously to the striking of high grade the Beaver had high grade ore on 600 feet, the deepest point attained in the camp at that time. The main vein at the 700-foot level was encountered a few weeks ago, but in the first twenty-five feet of drifting on it the vein failed to show any high values. It was not until the round fired last week that the ore shoot was encountered. The Temiskaming has also now a hundred feet of high grade ore below the Keewatin on their bottom level. It is significant that the vein systems in the diabase are new and not continuations of those mined in the keewatin above.

An interesting transfer of property was made by the Wallace syndicate, a number of Cobalt business men, to the Cobalt Aladdin Mining Company. Some time ago the Wallace syndicate bought both the Right of Way and the old Silver Queen dumps for a nominal price. They have shipped several cars of ore and declare to have made a good profit. It is certain that the ore in the old Silver Queen dump did run surprisingly high. The Wallace syndicate had a contract with the Nipissing Reduction mill to run their ore, and the Cobalt Aladdin wanted it to treat Chambers-Ferland low grade. The Cobalt Aladdin has now bought the two dumps and also taken over on a lease the Nipissing reduction mill.

### PORCUPINE SWASTIKA AND KIRKLAND LAKE.

The disaster at the Waiwaiten Falls plant will seriously incommode many mining companies in the Porcupine camp though its seriousness is relieved by the fact that the Sandy Falls plant is still working and most of the companies have steam plants of their own; both penstocks were broken, and some of the masonry under them swept away. It is hoped to have the damage repaired in upwards of a months time.

The effects of the strike have now almost disappeared and nearly every company desiring to operate at once is working. The Jupiter is using its own steam plant.

The Foley-O'Brien is to be operated again by a Buffalo syndicate, who have purchased the control. The Moneta is being diamond drilled. The Three Nations has all its mill machinery on the ground, the Hughes is operating its small stamp mill, and the Schumacher is now installing a big compressor plant with the plan of commencing development on a considerable scale. Mr. Joe Houston cut two veins, both promising with his diamond drill and is now going underground. The camp is very busy and experts to be still busier. The Dome and the Hollinger are now on a steady producing basis.

The strife between union and non-union men was stirred up again by a drunken brawl at Timmins when a non-union man shot at a striker for insulting him, but the Provincial police were in strong force and no disorder followed. The merchants are gradually recovering from the effects of the strike, though they have suffered most.

Practically all the foot loose prospectors in Northern Ontario are in or near Kirkland Lake. The surprising richness of the Foster Tough vein and the fact that it has endured to a depth of over a hundred feet has aroused surprisingly little excitement outside. The Foster Tough property has paid from the grass roots down and it now is looking remarkably well. There is no doubt whatever that in a few months, perhaps weeks, the public will be taken into the confidence of many syndicates and importuned for their own good, their own health and happiness, to make a hundred per cent. by financing some prospect. There are all the earmarks of a boom.

There appears to be no doubt of the promise of the district. The veins, though quite narrow, are much richer (that is they have been demonstrated so on two or three properties) than in Porcupine, and the operator is not plagued by the faults that makes the mine manager's life in the older gold camp a burden. The western engineers who have visited Kirkland Lake declare that conditions appear more familiar to them than at any other point in Northern Ontario, and they are certainly fore favourably impressed with it than any technical man who valued his reputation was with Porcupine at the same stage of development. Quite a number of deals have been negotiated though for no every large sums. The Great Northern Silver Mines have taken over the control of the Hughes, the second property in the section, and it is understood that it will be mined under the capable direction of Mr. John Redington. The Cobalt Aladdin, before exclusively busied with silver in the North, has rushed in and purchased the Burnside and is showing no tardiness in developing. A plant has been ordered already and a gang of men have been put to work at once. So far the development of the camp has been singularly healthy and free from inflation and boosting, but it is scarcely to be expected that it will remain so long. Swastika will probably remain the centre of settlement, and it is now quite busy after many lean years. At Swastika itself the Swastika mill is now making a little money for the pioneer company of the camp, and the mill at the Lucky Cross should be running soon. It is reported that the development at the Lucky Cross has been quite satisfactory lately.

## BRITISH COLUMBIA

The near approach of the time at which, under existing provisions therefor, the payment of bounty on lead mined and smelted in Canada will cease, is causing concern among lead-mine owners as to the intentions of the Federal Government with regard to the future. While it is generally believed that Government assistance will be continued in some form or other nothing definite has yet been publicly made known, so that there is uncertainty in the matter. While a considerable proportion (nearly one-third of the total to each, of the amount paid during the last calendar year was earned by two companies, there were at least twenty owners in West Kootenay district who also benefited, though in varying degree. In connection with this question, the following reference to lead production, taken from the Kaslo Kootenaian, is of interest: "Mr. G. O. Buchanan, Supervisor of Lead Bounties, states that the lead production in the month of February was about the largest in any month in the history of lead mining in the Dominion, a total of about 3,000 tons of lead having been produced by the mines and smelteries during that period. The greater part of this came from Ainsworth and Slocan mining divisions."

**Nelson.**—On March 13, according to The Daily News, a meeting of members of the Nelson board of trade passed a resolution as follows: "That this board feels assured, from the proofs submitted of the existence in this district of platinum and regrets the publication of the opinions of Mr. W. Fleet Robertson and Mr. E. Jacobs to the contrary until the matter has been more thoroughly investigated, and that a committee of three be appointed to act with the secretary in writing to the Minister of Mines and calling his attention to the damage being done to the mining industry of this district by such statements as have recently appeared." The committee appointed consist of Mr. C. R. Hamilton, barrister; Mr. R. W. Hinton, mechanical engineer; and Mr. J. O. Patenaude, jeweler. One of the men most prominent in the discussion that took place was Mr. Fred A. Starkey, formerly a grocer and provision merchant, now a "mining broker" and real estate agent, who was reported by The Daily News in part as follows: "Mr. Starkey declared that the report should never have got beyond the office of the Minister of Mines; that it was a 'disgrace to the country,' because it 'slandered this section of British Columbia.' He asserted that Mr. Robertson as a scientific man was not in any way the equal of Mr. A. Gordon French, who announced the discovery of platinum in this district."

(Incidentally, it may be mentioned that E. Jacobs did not publish any of his "opinions," but only the official report. Further, there was not at the meeting a mining engineer or mine manager of recognized good standing.)

On April 11 The Daily News published, under the heading "Platinum Report is Favorable," the following: "Board of Trade Committee Believes Metal Exists Here, but Cannot Say as to Quantities. Having received 22 copies of platinum assays of rock taken from the Nelson district in which values in platinum and other metals of that group were shown the special committee, consisting of C. R. Hamilton, K.C., R. W. Hinton, and J. O. Patenaude, appointed by the board of trade, reported last night stating there was every reason to believe that the metals existed here. The committee stated that it could not, of course, state if the metals were in commercial quantities, but suggested that a letter should be sent to the Minister of Mines regretting the publicity given to statements by W. Fleet Robertson, provincial mineralogist, and E. Jacobs, and asking for a further investigation. Fred A. Starkey stated last night that eight of nine assays had recently been received in the city from Philadelphia giving returns as high as $18 in platinum, in addition to gold. R. W. Hinton remarked that the high values did not necessarily prove the existence of the metal in commercial quantities, unless a careful sampling of a lead had been made. They were, nevertheless, an encouragement toward investigation."

**Rossland**—The fololwing editorial comment was published in the March number of The Mining Magazine, London: "The law of extra-lateral right, though founded on justice to the original discoverer of an ore deposit is apt to act preferentially toward the lawyers and the expert witnesses. The very mention of the name evokes visions of interminable lawsuits. We have, therefore, nothing but the sincerest congratulations to offer to the Le Roi No. 2 and the Consolidated Mining and Smelting Company of Canada for their wisdom in effecting a compromise in connection with the conflicting rights arising from their adjoining groups of claims at Rossland, British Columbia. The disputed ground lay in the Le Roi No. 2 property and it was claimed to belong to the Le Roi property, purchased a year ago by the Canadian company. The necessity for some such readjustment of interests was fully known to the directors before the Le Roi property was sold to the Canadian company, and the directors of the Le Roi No. 2 were therefore not unprepared. Le Roi No. 2 transfers portions of the No. 1 and Josie claims, together with certain underground rights to the Consolidated, and in return acquires the Moneta claim. The possession of the latter ground will greatly facilitate the development of ore bodies in the northern end of the Le Roi No. 2 property."

The quantity of ore produced from Rossland mines during the three months ended March 31 was approximately 63,000 tons. With the exception of less than 200 tons from several small shippers, the mines of The Consolidated M. and S. Co. and Le Roi No. 2, Ltd., made this production in about the following proportions: Consolidated Co.'s Centre Star-War Eagle group, 37,000 tons; Le Roi mine, 15,500 tons; total 52,500 tons. Le Roi No. 2's mines: Ore shipped, crude and concentrate, 5,500 tons; ore concentrated, 5,000 tons; total 10,500 tons. Mining operations in connection with the smaller properties continue to be comparatively unimportant. The Blue Bird has not been a producer for several months, and the Phoenix and Nickel Plate have shipped only small quantities of ore. It has been announced that the Richmond Consolidated intends to work its property, situated in the South Belt, also that it is intended to develop the San Francisco on a small scale under lease.

**Boundary District.**—The following is part of a long report published in this district, stated to have been taken from the annual report of the British Columbia Copper Co., this covering a period of thirteen months, to the end of 1912: At the company's smeltery at Greenwood, Boundary district, there was treated 740,589 tons of ore, of which 443,022 tons was from the company's mines, while the remainder was custom ore. The metals produced were 11,146,811 lbs. of copper, 142,025 oz. of silver, and 25,862 oz. of gold, these having an aggregate value of $2,483,663. The yield of copper, gold and silver, was less per ton than for any previous year, while the cost per ton for handling, etc., was lower than in any other year. Notwithstanding this low cost of handling the ore, the cost of producing copper was 12.85 cents per pound, the low yield of metals being accountable for this comparatively high cost. The net financial result of operations was a profit of $425,885.40 (the largest in the history of the company) from which amount there were paid during the period covered by the report two dividends, these aggregating $177,512. During the fiscal year the company paid on account of new properties, and for exploration and development work done on them, $229,489. This expenditure was made because of the great importance of supplementing the company's ore reserves. In addition, there was added to the company's holding of New Dominion Copper Co. securities, bonds of the par value of $238,675, these having cost $122,249.25.

Ore production during the three expired months of the year has been about 290,000 tons from the Granby Consolidated Co.'s mines at Phoenix, and 145,000 tons from the British Columbia Copper Co.'s Mother Lode and Rawhide mines. Small quantities were produced by several other properties, including about 700 tons from the Consolidated M. and S. Co.'s No. 7 mine, but these were unimportant about 3,000 tons in all.

Early in April the annual meeting of the Boundary Mining and Exploration Co. was held at Midway. Shareholders were informed that development work is resulting satisfactorily. Fourteen men are employed, machinery is being installed, and an incline shaft is being sunk from No. 2 tunnel to the coal.

**Coast District**—In the lower coast district metal mining operations are confined largely to three or four properties. In Vancouver mining division an organization known as the Lynn Creek Zinc Mines, Ltd., has for some time been developing a group of claims situated in the vicinity of Lynn Creek and distant about ten miles from Vancouver City. At the Britannia, in the same mining division, such further good progress has been made that since April 1st full time has been worked in all departments, excepting in the long cross-cut adit in which last two shifts, instead of three, are employed. The output of ore is being regularly maintained up to the treatment capacity of the concentrating plant, and shipments to the smeltery are again normal. Having sufficient men for development in addition to mining, that work has been resumed throughout the Britannia company's extensive property. Good progress is being made with the various improvements in hand, these including provision for the development of more hydro-electric power, construction of a railway from the face of the new tunnel down to Britannia Beach (about four miles of track), erection of new buildings in both the Beach and Tunnel camps, and the completion and equipment of a new concentrating mill.

No information has been received lately relative to the Tacoma Steel Co.'s Marble Bay mine, near Van Anda, Texada Island, but last advices were to the effect that only development work in the lower levels was being done, ore-production having been temporarily stopped.

On Vancouver Island, the situation is being gradually improved at the coal mines of the Canadian Collieries (Dunsmuir) Limited. Figures published at the beginning of April showed that during the week ended March 28 the output of coal from the company's Union Colliery mines, Cumberland district, was 8,891 tons. Miners have been arriving at Cumberland from various parts, including some from Great Britain, and matters generally are steadily approaching a position similar, as regards operation of the mines and production of coal, to that existing prior to the strike declared about seven months ago. A beginning has been made at the company's Extension colliery, as well, and it is stated that about 200 men are now at work there.

# COMPANY NOTES

## CROW'S NEST PASS.

The report of the Crow's Nest Pass Coal Company has been distributed. The net profits were $471,454 and, deducting from this a debit of $52,030 brought forward from the previous year, leaves a profit and loss surplus of $419,424.

The net profits were at the rate of 7.58 per cent. on the paid-up capital stock.

Coal mined during the year was 1,064,791 tons, compared with 359,456 tons in 1911; while coke produced in 1912 was 245,229 tons, against 60,659 tons in 1911. During 1911 the mines were closed down for eight months on account of the strike of miners.

**Balance Sheet.**

The balance sheet and profit and loss account follow:

| | 1912 | 1911 |
|---|---|---|
| Balance | *$ 52,030 | $210,734 |
| Dividends received | 786 | 10,484 |
| Profits | 470,668 | 52,094 |
| | $419,424 | $273,312 |
| Loss on operation | | 263,232 |
| | $419,424 | $10,080 |
| Dividends paid | | 62,110 |
| Surplus | $419,424 | $52,030 |

*Debit balance.

Liabilities.

| | 1912 | 1911 |
|---|---|---|
| Capital stock | $6,212,666 | $6,212,666 |
| Profit and loss | 419,424 | .......... |
| Insurance fund | 26,072 | ......... |
| Bills payable | 1,212,437 | 1,634,612 |
| | $7,870,599 | $7,847,278 |

Assets.

| | 1912 | 1911 |
|---|---|---|
| Mines, etc. | $6,478,705 | $6,720,340 |
| Securities | 776,753 | 815,160 |
| Accounts receivable | 347,861 | 256,302 |
| Cash | 113,703 | 3,446 |
| Profit and loss | ....... | 52,030 |
| Inventories | 153,577 | ....... |
| | $7,870,599 | $7,847,278 |

During the year the amount spent on improvements charged to capital account was $19,976.31, and the amount spent on development charged to capital account was $18,418.58.

The Crow's Nest Pass Electric Light and Power Company, Limited, carried forward to the credit of profit and loss account, last year, $1,134.73. The profits for the year 1912 amounted to $5,863.81, making the total amount at the credit of profit and loss account of that company, December 31st, 1912, $6,998.54.

The Morrissey, Fernie & Michel Railway Company carried forward a loss last year of $7,002.31. That loss has been made up during the year, and there is now $25,078.49 at the credit of profit and loss account, or a total profit of all companies for the year 1912 of $509,398.77.

President Rogers points out that during the year the indebtedness to the banks had been reduced to $568,099. At the end of the year it stood at $795,000, and since the end of the year the company has paid $70,000 more to the First National Bank, leaving the indebtedness now standing at $725,000.

### ANNUAL MEETING MARITIME COAL.

At the annual general meeting of the shareholders of the Maritime Coal, Railway and Power Company, Limited, April 22nd, the following were elected directors for the ensuing year: Wm. Hanson, A. E. Dyment, Alex McLaurin, Wm. Ewing, G. Ratcliffe Hume, W. L. Madgen, Hon. Senator Wm. Mitchell, and Hon. Senator N. Curry.

The president reported that the negotiations for the sale of a considerable block of the company's securities had been successful, and it was contemplated to carry out, during the ensuing year, large extensions to the power plant at Joggins' Mines, to cope with increasing demand for coal and electric power.

Wm. Hanson was elected president; A. E. Dyment, vice-president, and R. Wilson, secretary.

### GRANBY'S MARCH FIGURES.

Granby's operations at Phoenix and Grand Forks for the mont hof March showed a profit of $87,770, and for the nine months of the fiscal year $990,255. The yield of metals has been fully maintained, and the cost of copper for March slightly reduced, but current profits for a portion of this period were interfered with by the decline in the price of metal. All figures are now based on 4½, copper, and on the 31st of March we had on hand 1,935 tons taken in at that figure. Reports from the development work of the old properties indicate that ore reserves there have been fully maintained.

### BEAVER CON.

At the annual meeting of the Beaver Consolidated Mines, held in Toronto on April 22nd, it was pointed out that the finances of the company at present did not warrant the declaration of an April dividend, owing to the large amount of money being spent in development work. It was stated, however, that the directors expected to be able to declare as many dividends as in 1912.

# STATISTICS AND RETURNS

### COBALT ORE SHIPMENTS.

**Week Ending April 19.**

The shipments for the week, in pounds, are:

| Mine. | High | Pounds |
|---|---|---|
| O'Brien | 1 | 78,668 |
| Right of Way | 1 | 62,136 |
| Coniagas | 2 | 102,971 |
| McKinley-Darragh | 2 | 121,884 |
| Dominion Reduction | 1 | 83,612 |
| | 7 | 439,271 |

The bullion shipment for the week was:

| Mine | Bars | Ounces | Value |
|---|---|---|---|
| Nipissing | 107 | 130,357.74 | $78,214.64 |

The bullion shipments to date are:

| Mine | Ounces | Value |
|---|---|---|
| Nipissing | 1,437,906.21 | $840,486.98 |
| Buffalo | 464,422.50 | 282,308.76 |
| Crown Reserve | 108,891.00 | 72,394.00 |
| Temiskaming | 4,000.00 | 2,228.00 |
| O'Brien | 42,547.77 | 24,914.40 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miscellaneous | 2,298.00 | 1,650.00 |
| Miller Lake | 1,734.20 | 970.15 |
| Colonial | 635.00 | 374.00 |

| | | |
|---|---|---|
| Trethewey | 5,007.00 | 3,223.00 |
| Townsite | 6,770.00 | 4,209.00 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 7,300.71 | 4,894.35 |
| Dominion Reduction | 125,591.40 | 68,992.35 |
| | 2,214,212.79 | $1,311,089.99 |

The shipments from the Cobalt mines to date, are:

| Mine | High | Low | Tons |
|---|---|---|---|
| Beaver | 4 | .. | 99.75 |
| Townsite | 16 | .. | 579.08 |
| Crown Reserve | 5 | .. | 249.95 |
| Chambers-Ferland | 1 | 4 | 159.20 |
| Colonial | 1 | .. | 21.56 |
| Coniagas | 17 | .. | 538.32 |
| Cobalt Lake | 7 | .. | 109.72 |
| Penn Canadian | 1 | .. | 32.06 |
| Drummond | 7 | .. | 189.39 |
| General Mines | .. | 0 | 8.80 |
| Hudson Bay | 5 | .. | 157.65 |
| Kerr Lake | 6 | .. | 234.79 |
| La Rose | 20 | .. | 813.11 |
| McKinley-Darragh | 21 | .. | 727.99 |
| Nipissing | 2 | 15 | 587.37 |
| O'Brien | 4 | .. | 156.75 |
| Peterson Lake (Seneca Sup.) | 2 | 3 | 188.42 |
| Silver Queen | .. | .. | 60.34 |
| Temiskaming | 7 | 1 | 228.76 |
| Trethewey | 2 | 1 | 182.15 |
| Bailey | 3 | 1 | 182.15 |
| Casey Cobalt | 3 | .. | 109.72 |
| Right of Way | .. | 2 | 62.19 |
| Dominion Reduction | 5 | .. | 138.19 |
| Brewer Bros. | 1 | .. | 20.00 |
| City of Cobalt | 3 | .. | 109.50 |
| | 142 | 30 | 11,842.66 |

## COBALT ORE SHIPMENTS.

### Week Ending April 26.

The shipments for the week, in pounds, are:

| Mine | High | Low | Pounds |
|---|---|---|---|
| Townsite | 2 | .. | 151,704 |
| La Rose | 3 | 1 | 320,661 |
| Nipissing | .. | 4 | 256,856 |
| Peterson Lake (Seneca-Superior Lease) | 1 | .. | 63,962 |
| Temiskaming | 1 | .. | 83,717 |
| McKinley | 2 | .. | 125,567 |
| Dominion Reduction | 1 | .. | 87,950 |
| Beaver | 1 | .. | 72,460 |
| | 11 | 5 | 1,162,877 |

The shipments from the Cobalt mines to date, are:

| Mine | High | Low | Tons |
|---|---|---|---|
| Beaver | 5 | .. | 135.98 |
| Townsite | 18 | .. | 654.93 |
| La Rose | 23 | 1 | 973.44 |
| Nipissing | 2 | 19 | 715.79 |
| Peterson Lake (Seneea-Sup.) | 3 | 3 | 220.40 |
| Temiskaming | 8 | 1 | 278.61 |
| MeKinley-Darragh | 23 | .. | 790.77 |
| Dominion Reduetion | 6 | .. | 182.16 |
| Crown Reserve | 5 | .. | 249.95 |
| Chambers-Ferland | 1 | 4 | 159.20 |
| Colonial | 1 | .. | 21.56 |
| Coniagas | 17 | .. | 538.32 |
| Cobalt Lake | 7 | .. | 109.72 |
| Penn Canadian | 1 | .. | 32.06 |
| Drummond | 7 | .. | 189.39 |
| General Mines | .. | 0 | 8.80 |
| Hudson Bay | 5 | .. | 157.65 |
| Kerr Lake | 6 | .. | 234.79 |
| O'Brien | 4 | .. | 156.75 |
| Silver Queen | .. | .. | 60.34 |
| Trethewey | 2 | 1 | 182.15 |
| Bailey | 3 | 1 | 182.15 |
| Casey Cobalt | 3 | .. | 109.72 |
| Right of Way | .. | 2 | 62.19 |
| City of Cobalt | 3 | .. | 109.50 |
| Silver Bar | 1 | .. | 20.00 |
| | 152 | 35 | 6,528.32 |

The bullion shippers this week were:

| Mine. | Bars | Ounces | Value |
|---|---|---|---|
| Nipissing | 121 | 148,264.52 | $88,588.05 |
| Buffalo | 71 | 73,264.09 | 44,000.00 |
| Dom. Reduction | 44 | 49,760.00 | 29,858.40 |
| Total | 236 | 271,292.61 | $162,446.45 |

The bullion shipments to date are:

| Mine | Ounces | Value |
|---|---|---|
| Nipissing | 1,586,170.73 | $929,075.03 |
| Buffalo | 537,686.59 | 326,308.76 |
| Dom. Reduction | 175,351.40 | 98,850.75 |
| Crown Reserve | 108,891.00 | 72,394.00 |
| Temiskaming | 4,000.00 | 2,228.00 |
| O'Brien | 42,547.77 | 24,914.40 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miscellaneous | 2,298.00 | 1,650.00 |
| Miller Lake | 1,734.20 | 970.15 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 5,007.00 | 3,223.00 |
| Townsite | 6,770.00 | 4,209.00 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 7,300.71 | 4,894.35 |
| Total | 2,485,501.40 | $1,473,536.34 |

## B. C. ORE SHIPMENTS.

Ore production in the Kootenay and Boundary districts for the week ending April 12th, totalled 51,586 tons, making a total for the year to date 733,308 tons. Smelter reeeipts last week were 45,386 tons and for the year to date 634,346. Production in detail was:

### Slocan and Ainsworth.

| | Week | Year |
|---|---|---|
| Standard, milled | 500 | 7,500 |
| Van Roil, milled | 1,100 | 16,600 |
| Bleubell, milled | 1,200 | 17,800 |
| Kilo, milled | 100 | 1,500 |
| Rambler-Cariboo, milled | 300 | 4,500 |
| Riehmond-Eureka | 63 | 286 |
| Standard | 562 | 4,533 |
| Bluebell | 228 | 2,648 |
| Eastmount | 27 | 117 |
| Silver Hoard | 44 | 147 |
| Hope | 26 | 371 |
| No. 1 | 42 | 390 |

| | | |
|---|---|---|
| Neepawa | 25 | 25 |
| Other mines | ... | 1,898 |
| Total | 4,217 | 58,406 |

**Boundary.** 4

| | | |
|---|---|---|
| Nickle Plate, milled | 1,500 | 22,500 |
| Granby | 23,897 | 335,367 |
| Mother Lode | 7,268 | 97,366 |
| Rawhide | 6,055 | 74,618 |
| Napoleon | 781 | 10,999 |
| Queen Victoria | 530 | 8,188 |
| Unnamed | 108 | 1,623 |
| Ben Hur | 238 | 2,804 |
| United Copper | 66 | 1,400 |
| No. 7 | 128 | 1,116 |
| Lone Pine | 276 | 895 |
| Other mines | ... | 3,174 |
| Total | 40,847 | 560,030 |

**Rossland.**

| | | |
|---|---|---|
| Le Roi, No. 2, milled | 350 | 5,250 |
| Inland Empire, milled | 100 | 1,500 |
| Centre Star | 2,525 | 42,060 |
| Le Roi | 912 | 18,708 |
| Le Roi No. 2 | 301 | 6,380 |
| Nickle Plate | 19 | 77 |
| Other mines | ... | 102 |
| Total | 4,207 | 74,077 |

**East Kootenay.**

| | | |
|---|---|---|
| Sullivan | 932 | 10 956 |
| St. Eugene | 94 | 488 |
| Total | 1,026 | 11,444 |

**Nelson.**

| | | |
|---|---|---|
| Queen Victoria | 530 | 8,188 |
| Mother Lode, milled | 500 | 7,500 |
| Second Relief, milled | 200 | 3,000 |
| Yankee Girl | 39 | 1,520 |
| Other mines | ... | 9,281 |
| Total | 1,289 | 28,489 |

**Lardeau.**

| | | |
|---|---|---|
| Other mines | ... | 137 |

**B. C. Copper Co.'s Receipts.**

Greenwood, B.C.

| | | |
|---|---|---|
| Mother Lode | 7,268 | 97,366 |
| Rawhide | 6,055 | 74,618 |
| Napoleon | 781 | 10,999 |
| Queen Victoria | 530 | 8,188 |
| Unnamed | 108 | 1,623 |
| Total | 14,742 | 192,794 |

**Consolidated Co.'s Receipts.**

Trail, B. C.

| | | |
|---|---|---|
| Centre Star | 2,525 | 42,060 |
| Le Roi | 912 | 18,708 |
| Le Roi No. 2 | 301 | 6,380 |
| Nickle Plate | 19 | 77 |
| Sullivan | 932 | 10,956 |
| St. Eugene | 94 | 488 |
| Yankee Girl | 39 | 1,520 |
| Richmond-Eureka | 63 | 286 |
| Standard | 562 | 4,533 |
| Bluebell | 228 | 2,648 |
| Eastmount | 27 | 117 |
| Silver Hoard | 44 | 147 |
| Hope | 26 | 371 |
| No. 1 | 42 | 390 |
| Neepawa | 25 | 25 |
| Ben Hur | 238 | 2,804 |
| United Copper | 66 | 1,400 |
| No. 7 | 128 | 1,116 |
| Lone Pine | 276 | 895 |
| Other mines | ... | 11,254 |
| Total | 6,747 | 106,185 |

**Granby Smelter Receipts.**

Grand Forks, B.C.

| | | |
|---|---|---|
| Granby | 23,897 | 335,367 |

## TORONTO MARKETS.

April 28th.—Pig Iron (Quotations rom Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.50 to $21.00 (f.o.b. Toronto).
Midland No. 2, $20.50 to $21.00 (f.o.b. Toronto).

## GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75 per ton.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

**Coke.**

April 25th—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $2.00 to $2.25 per ton.
Foundry coke, prompt, $3.00 to $3.50 per ton.

April 25th—Tin, Straits, 49.75 cents.
Copper, Prime Lake, 15.60 to 15.70 cents.
Electrolytic copper, 15.55 to 15.65 cents.
Copper wire, 16.75 cents.
Lead, 4.50 cents.
Spelter, 5.60 to 5.70 cents.
Sheet zinc (f.o.b. smelter), 7.75 cents.
Antimony, Cookson's, 9.00 cents.
Aluminium, 26.75 to 27.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $1.75 to $2.00 per pound.
Quicksilver, $39.00 to $40.00 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| April 10 | 60¼ | 27¾ |
| " 11 | 60 | 27⅝ |
| " 12 | 60 | 27$\frac{11}{16}$ |
| " 14 | 59¾ | 27$\frac{9}{16}$ |
| " 15 | 59¼ | 27$\frac{5}{16}$ |
| " 16 | 59⅛ | 27¼ |
| " 17 | 59⅜ | 27⅜ |
| " 18 | 59¾ | 27$\frac{9}{16}$ |
| " 19 | 59⅝ | 27½ |
| " 21 | 59¾ | 27$\frac{9}{16}$ |
| " 22 | 60 | 27$\frac{11}{16}$ |
| " 23 | 60⅛ | 27¾ |
| " 24 | 60½ | 27⅞ |
| " 25 | 60⅜ | 27$\frac{13}{16}$ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

**Dominion of Canada.**

**Ontario**

Astley, J. W.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
Tyrrell, J. B.
Willmott, A. B.

**Quebec**

Cohen, S. W.
DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Obalski & Dulieux
Ross, J. G.
Woolsey, W. J.

**British Columbia**

Ashworth, James
Fowler, S. S.

**FOREIGN-New York**

Hassan, A. A.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

**Dominion of Canada**

**Ontario**

Campbell & Deyell
Heys, Thos. & Son.
Canadian Laboratories, Ltd.

**Quebec**

Hersey, Milton Co., Ltd
Obalski & Dulieux
Dr. J. T. Donald

**Foreign-New York**

Ledoux & Co.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

**ASHWORTH, JAMES**
MEMB. S. W. I. E.
Consulting Mining Engineer,
General Manager Crows Nest Pass Coal Co.
1909—1911
1109 Hornby St. VANCOUVER, B. C

**ASTLEY, J. W.**
Consulting Mining Engineer,
24 King Street West,
TORONTO, CANADA.
Phone M, 5199, Code: Bedford McNeill

**CARTER & SMITH**
Consulting Mining Engineers
448-449 Confederation Life B'ldg
TORONTO
W. E. H. Carter B.A. Sc. Alex. H. Smith, M.I.M.M.

**COHEN, SAMUEL W., E. M.**
Consulting Engineer,
Room 601, Dom. Express Bldg. Montreal
General Manager,
Crown Reserve Mining Co. Ltd.
Cobalt, Can.

**Colvocoresses, George M.,**
*Mining Engineer*
43 Exchange Place
New York City

**DEPENCIER, H. P.**
Consulting Mining Engineer
Room 613, Dominion Express Bldg.,
MONTREAL.
Phone Main 4984 P. O. Box 763

**EVANS, J. W.**
Mining Engineer,
Mines and Mining Properties examined and reported upon.
Belleville, Ontario.

**FORBES, D. L. H.**
Mining & Metallurgical Engineer
306 Manning Chambers, Toronto, Ont.
Mine Examination and Consultation.
Metallurgical Engineer for Merrill Metallurgical Co.

**FOWLER, S. S.**
Mining Engineer,
NELSON, B. C.

**FERRIER, W. F.**
Mining Engineer and Geologist
204 Lumsden Bldg., Toronto, Ont.
General Manager, Natural Resources Exploration Co., Limited.

**FORBES, H. L. M.Sc.,**
Mining Engineer
77 Sparks Street., OTTAWA, CAN
Specialty: Mica Phosphate.

**GWILLIM, J. C.**
Consulting Mining Engineer,
KINGSTON, ONT.

**GRAHAM, STANLEY N., B.Sc.**
Mining Engineer
BOX 92
COBALT, ONTARIO

**HASSAN, A. A., COBALT, ONT.**
Mining Geologist and Consulting Engineer.
61 Waldorf Court, Brooklyn, N. Y.
Special study and advice upon Ontario and Quebec mineral deposits, Including Cobalt and Porcupine.
Any Code. Cable Address: "Asghar"

**HILLE, F.**
Mining Engineer.
Mines and Mineral Lands Examined and Reported On.
Port Arthur, Ontario, Canada.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# BUYERS AND SELLERS OF METALS

## ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamators—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos Hayes & Son, 124 Yonge St. Toronto.
Canadian Laboratories, Ltd.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.

**Beams—Steel—**
Dominion Bridge Co. ... ...
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Belting—**
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.
Federal Engineering Co., Ltd.

**Blasting Batteries and Supplies—**
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Peacock Brothers.
John Davis & Sons.
Mussens, Limited.
Canadian Explosives, Ltd.

**Blowers—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Boilers—**
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
John Inglis Co., Ltd.

**Buckets—**
Peacock Bros.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

**Building—Steel Frame—**
Dominion Bridge Co.
Canada Foundry Co.

**Cable — Aerial and Underground—**
Fraser & Chalmers, Ltd.

**Cableways—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

**Castings—**
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Crushers—**
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

**Coal Tipples—**
Jeffrey Mfg. Co.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.
John Inglis Co., Ltd.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

**Condensers—**
Allis-Chalmers-Bullock, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co., Ltd.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

**Elevator Buckets—**
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock, Ltd.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock, Ltd.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonian Iron Works, Ltd.

**Excavators—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

**Generators—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Peacock Brothers.

**Continued on page 36.**

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.
**Girders—Steel—**
Dominion Bridge Co.
**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
**High Speed Steel Twist Drills—**
Mussens, Limited.
**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jeckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.
**Hoisting Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
**Injectors—**
Mussens, Limited.
Peacock Bros.
**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
**Lamps—Arc—**
Canadian Westinghouse.
Siemens Co. and Can., Ltd.
**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.
**Levels and Rules—**
C. L. Berger & Co.
John Davis & Sons.
**Lights—Mine Bldg.—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
**Link Belt—**
Waterous Engine Works.
Jones & Glassco.
**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.
**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.
**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.
**Monel Metal—**
Orford Copper Co.
**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.
**Nickel—**
Can. Copper Co.
**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
**Ore Samplers—**
Can. Laboratories.
Campbell & Deyell.
**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.
**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.
**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.
**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.
**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.
**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
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**Pumps—Sinking—**
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Peacock Bros.
Laurie & Lamb.
Canada Foundry.
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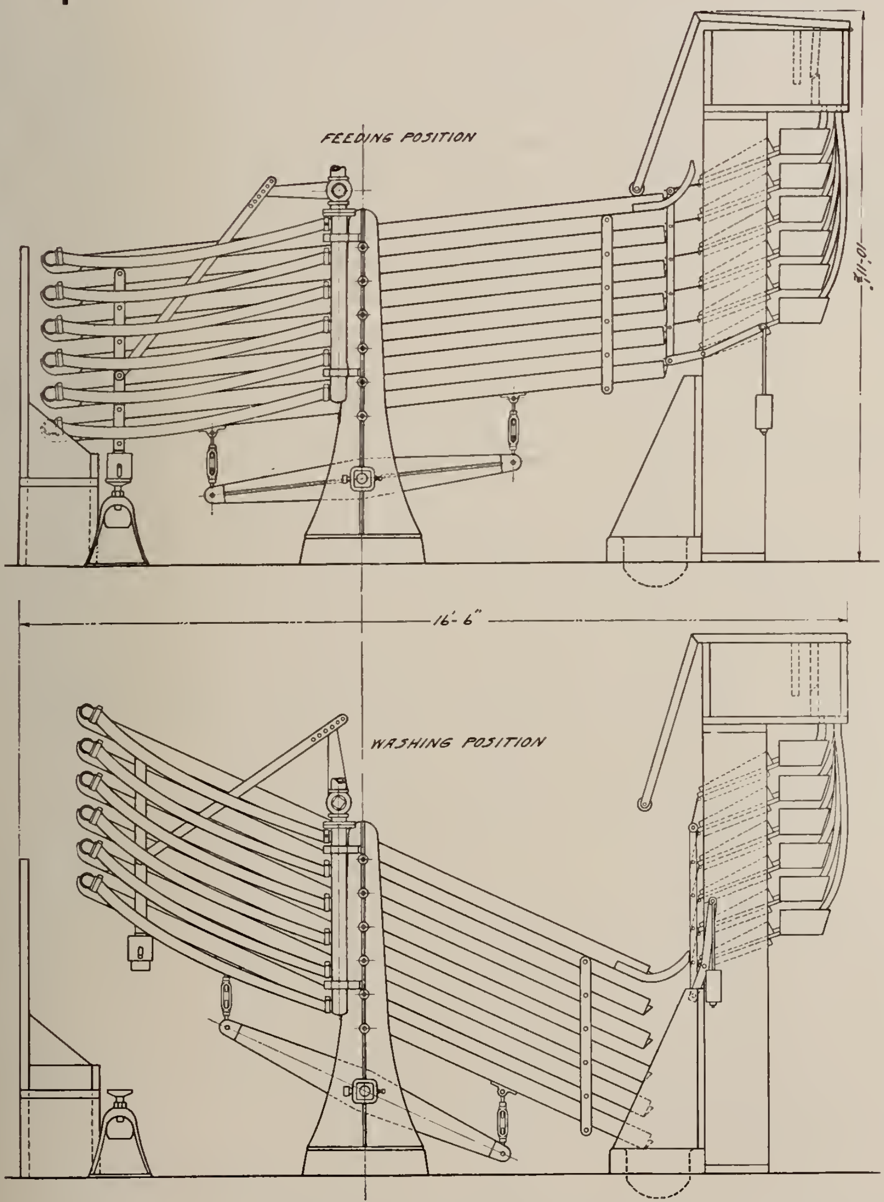


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OL. 34 TORONTO No. 10

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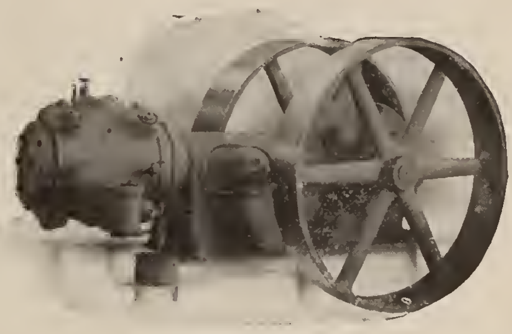

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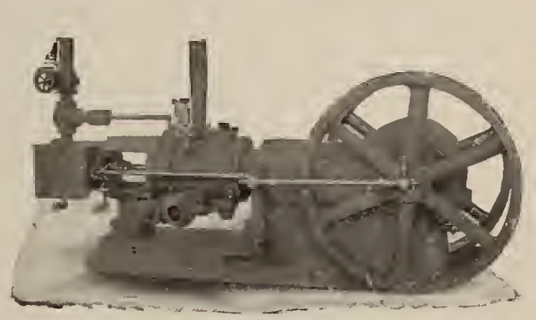

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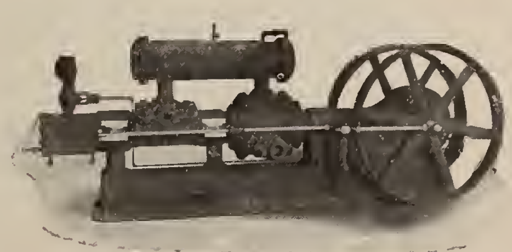

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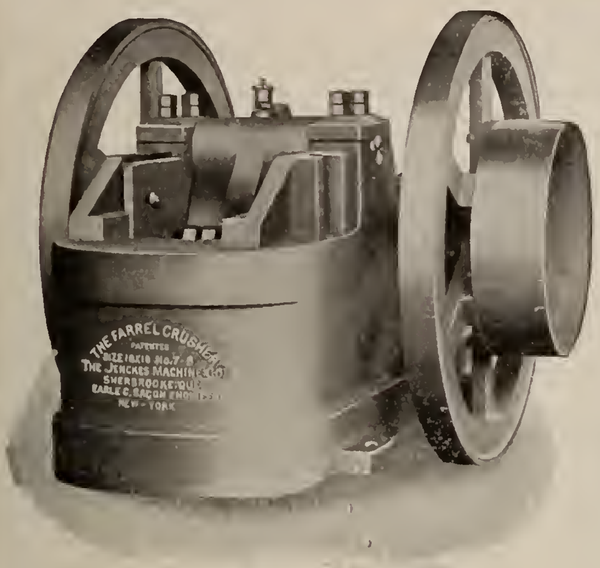


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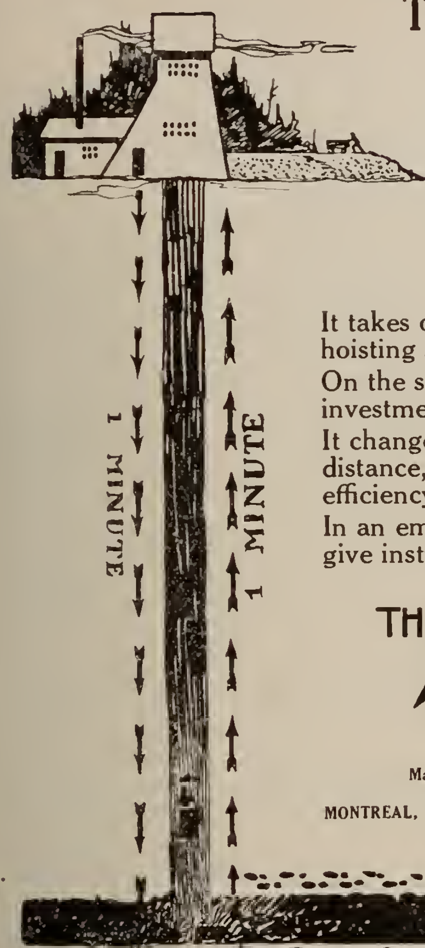


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# THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, May 15, 1913. No. 10

## The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

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*Editor*

J. C. MURRAY. B.A., B.Sc.

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.



## LEGISLATURE NEEDS

The session at Ottawa is drawing to a close. Nothing has been done as regards mining legislation, nor is there much possibility that anything can be done this year. The Naval Bill has, of course, occupied almost completely the attention of the House. And this has been but one of the evidences of the costliness of His Majesty's Loyal Opposition. How far the blocking tactics may have been necessary from a political point of view is not for us to say. Yet we believe that we are expressing the view of the generality of Canadian citizens when we state that the whole naval incident, or series of incidents, has been nauseating. Not only has the proper administrative business of the country been relegated to the background, but a large number of urgent questions have been given no consideration whatsoever.

Some weeks ago we drew attention to the carelessness of the Dominion Government's attitude towards the mining industry. Let us here quote one paragraph from our published editorial:

"There has been ample mincing of words and phrases heretofore. The Canadian Mining Institute, through its delegations and at its meetings, has voiced the desire of the mining man for better treatment. Whilst its delegates have walked softy and talked politely, they cannot have failed to impress upon the Rt. Hon. Mr. Borden and his Ministers the fact that the Institute as a whole deplores and resents the futility of the past and present situations. Briefly, therefore, the treatment accorded the mining industry appears to be calmly deliberate."

As a corrective to this Governmental indifference we urged the organization of mining men into an organic entity that would count politically. The longer the present circumstances are permitted to exist, the more pronounced will the industry's grievance become. It matters not whether it be the Naval Bill, or any other disturbing factor, we are convinced that the Government will not give due consideration to mining affairs until it is forced to.

As a piece of constructive legislation there is nothing more needed than a uniform Canadian mining law. True, it will take much effort and much time to bring about a clear understanding between the various Provinces and the Dominion. The proposed law will be a process hather than an event. But it is high time that a start were made. We are losing prestige with every day of delay.

To bring the whole matter to a head, we would propose that the Canadian Mining Institute, the only organization that can be utilized for the purpose, canvass its members for an expression of opinion. To this end it will be necessary that a draft of the representations be printed and circulated. The membership of the Institue is abundantly comprehensive. A plebiscite of this kind will be instructive and impressive. To the argument that such a step might be bad politics, we would reply that there is not the slightest need of considering political expediency as it is self-evident that the mining industry gets little consideration from the politician.

In closing, we may remark that the present Dominion Government is obviously ignorant of the needs of the industry that we have the honour to represent. If it is not ignorant, then the only conclusion is that it does not care—a painful and pregnant conclusion.

## THE OTTAWA LABORATORY

On another page we reproduce a list of the mechanical equipment installed in the new ore testing laboratory of the Dominion Mines Branch at Ottawa. The official designation of the laboratory is the Dominion of Canada Ore Dressing and Metallurgical Laboratory. The object of this establishment is to supply to the mining public of Canada a means whereby large lots of ore can be efficiently tested.

The equipment appears to be well chosen and complete. One of the chief items is a 5-stamp battery. The cyanide testing outfit, although of laboratory size, is capable of handling sufficiently large samples. The minimum limit for small scale tests is placed at 200 pounds, for large scale tests the samples must be at least five tons.

The Mines Branch reserves the right to publish the results of all tests.

While at several of our universities there are ore testing establishments, no private individual has yet organized one in Canada. There are, it is true, several customs mills and one large shipment sampling plant in Canada, but these handle silver ores only.

While we are entirely in sympathy with the movement, it must be pointed out that extreme care should be taken not to overlap or compete with the work of the private assayer. It must also be remarked that there is danger of the official Government report being misused. Unfair sampling may easily lead to complications, and be made the basis of raising money for mining schemes.

Moreover, there is room for much difference of opinion as to the relative value of large scale and small scale tests. It does not follow that because five tons or twenty tons have been milled, the results are more accurate tha nthose obtained from careful sampling on a small scale. Naturally, much can be learned by means of the larger tests as to treatment. But it must always be borne in mind that mechanical considerations make the control of any given sample shipment a matter of extreme difficulty, whereas the small laboratory sample can, with proper care, be depended upon for accurate results.

We repeat, therefore, that whilst we wish the new enterprise all success, we think it most necessary that every pains be taken not to interfere with private assayers.

## THE NIPISSING REPORT

According to the eighth annual report of the Nipissing Mines Company, just issued, the operations during the calendar year 1912 were highly satisfactory. Dividends to the amount of $1,800,000 were distributed, the sum of $240,000 was added to the surplus, and the ore reserves were increased by 1,750,000 ounces. In addition, the new "low grade" mill, costing $325,000, was paid for out of earnings.

The total silver produced was 4,688,260.79 ounces, having a gross value of $2,896,990.10, and costing altogether $815,279.95, or 17.39 cents per ounce. General operating expenses accounted for 12.08 cents per ounce, high grade milling for 2.12 cents, low grade milling for 0.66 cent, and depreciation for 1.12 cents. The average price received for the silver was 61.457 cents per ounce.

Nipissing, up to the end of last year, had paid $10,-168,297.25 in dividends. Of this magnificent total more than 70 per cent. was distributed in the last four years. On account of the large territory to be prospected, the exploration charges are high, and will probably remain so for some years to come. Of drifting, crosscutting, raising, and sinking, a total footage of 13,020 feet was covered during the year, and 15,764 cubic feet stoped. During the summer, 33.2 acres of ground were hydraulicked, an expeditious and efficient means of prospecting, far more satisfactory than the costly trench. Although most of this territory had been trenched before, numerous small veins and stringers were discovered.

With ore reserves carrying a total of nearly ten millions ounces, with a surplus of $1,443,953.09, and with an admirably complete plant, Nipissing is in an enviable position.

## EDITORIAL NOTES

International Geological Congress preparations are going forward smoothly. We may venture to suggest that thoroughly organized newspaper publicity should not be neglected.

Gold mining in Nova Scotia, quiescent as it may seem, is not yet dead. Four properties are being examined by American engineers at present, and there are other symptoms of activity.

## MORE ALCHEMY

The high-water mark for pure and applied nonsense has been reached by Mr. G. W. Rumble, of South Berkeley, California. Rumble even eclipses our lamentable friend, Mr. Thurber, who, our readers will remember, was the father of a process for getting gold out of any old rock.

Mr. Rumble's idea is ostensibly the application of a "new, simple, cheap, efficient solvent" to refractory ores and black sands. In his own elegant phraseology "it's a Salts." A flat cost of 25 cents per ton of ore is indicated. "Come on" invites the rambling Rumble.

The strange fact is that somebody will be sure to "come on." The Rumbles and the Thurbers and all the varieties of the type find easy victims in the unthinking public. It is not probable, however, that Mr. Rumble's career will be either long or glorious.

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APRIL, 1913.

### ORE SOLVENT.

I have a new, simple, cheap, efficient solvent for refractory ores and Black Sands whereby the refractory condition of the ore is neutralized so the values go into the Quick. Gold. Platinum.

It comes nearer to recovering ALL the values than any other known method.

It's a Salts, to be wholly dissolved in water, 48 water to 1 salts.

Cost for Salts, 25 cents per ton of ore.

### FOR PLATES IT IS THE BEST ON EARTH.

It prepares copper plates to take and hold the Quick and keeps them in condition the best ever.

Come on, I have a small Laboratory and test plant here. Will tell and show you all, and send you sample of Salts so you can test.

(PATENTED)

G. W. RUMBLE.

---

**THE MINING MANUAL AND MINING YEAR BOOK —1913. Price, $5.00. Published by Walter R. Skinner, London, E.C. For sale by the Canadian Mining Journal.**

From year to year Mr. Skinner's directory increases in size and value. It is one of the prime necessities of the mining investor or engineer who has business relations in other countries.

It contains in this annual addition particulars of 3,050 mining companies. In addition to this, it gives the names of 5,300 companies, 6,000 directors and 1,300 secretaries are listed, and the names and addresses of 1,200 mining engineers and managers are given. The amalgamation of the Mining Manual with the Mining Year Book (formerly published by the Financial Times), widens the scope of the directory so as to include nearly all the important mining companies of the world.

We note with regret that Mr. Skinner in his prefatory review, avers that "the Porcupine field has quite failed to answer expectations." This is not the case and we would suggest that an apology is due.

---

Mr. George B. Burchell, formerly manager of the Joggins collieries, Nova Scotia, has removed to 274 Addington Avenue (Notre Dame de Grace), Montreal.

Mr. L. B. Orchard, formerly connected with the Londonderry Iron & Mining Company, has just returned from South America and is at present in Calgary.

Mr. G. C. Bateman recently visited Porcupine.

# NIPISSING ANNUAL

## EXTRACTS FROM GENERAL MANAGER'S REPORT.

### Shipments in 1912.

| | Dry Tons | Gross Ounces Silver | Net Value | Per Cent. of Total. Net Value |
|---|---|---|---|---|
| High Grade Ore | 121.5635 | 325,246.92 | $ 183,140.83 | 6.48 |
| Low Grade Ore | 1,414.4910 | 330,990.97 | 168,574.96 | 5.96 |
| Concentrate | 180.6080 | 153,373.21 | 85,081.54 | 3.01 |
| Total Ore | 1,716.6625 | 809,611.10 | 436,797.33 | 15.45 |
| Silver Bullion | 146.1580 | 4,258,640.81 | 2,612,812.50 | 92.41 |
| Bullion from Ore milled by Nova Scotia Co. | .7140 | 20,827.56 | 11,130.05 | .39 |
| Total Shipments | 1,863.5345 | 5,089,079.47 | $3,060,739.88 | 108.25 |
| Less Bullion from Ore purchased | 12.6715 | 369,501.26 | 233,440.30 | 8.25 |
| Shipments of Nipissing Product | 1,850.8630 | 4,719,578.21 | 2,827,299.58 | 100.00% |

### Summary of Shipments, 1912.

| | Nipissing Production Only. |
|---|---|
| Dry Tons Shipped | 1,850.863 |
| Gross Ounces Silver Contained | 4,719,578.21 |
| Gross Silver Value | $2,892,581.42 |
| Average Price Received per oz., cents | 61.457 |
| Received from Sales of Cobalt | $673.90 |
| Gross Silver Value plus Cobalt paid for | $2,893,255.32 |
| Smelter Deduction, Treatment and Freight | 65,955.74 |
| Net Value Received from Sales | $2,827,299.58 |

### Production in 1912.

| | Dry Tons | Gross Ozs. Silver | Gross Value | Net Value |
|---|---|---|---|---|
| Shipments in 1912 | 1,850.8630 | 4,719,578.21 | $2,893,255.32 | $2,827,299.58 |
| On Hand at Mine, December 31st, 1912 | 253.9550 | 712,897.44 | 432,355.86 | 416,634.67 |
| | 2,104.8180 | 5,432,376.65 | $3,326,611.18 | $3,243,934.25 |
| On Hand at Mine December 31st, 1911 | 267.9815 | 744,115.86 | 428,621.08 | 413,990.35 |
| Production in 1912 | 1,836.8365 | 4,688,260.79 | $2,896,990.10 | $2,829,943.90 |

### Cost of Producing Silver.

Based on Production of 4,688,260.79 Ounces.

| | | Per Oz. Silver |
|---|---|---|
| General Operating— | | |
| Hydraulicing and Clearing Land | $ 19,292.67 | |
| Development and Exploration | 268,906.08 | |
| Stoping | 83,548.52 | |
| Ore Sorting and Loading | 17,770.78 | |
| Jigging | 5,978.06 | |
| Sampling | 6,271.50 | |
| Assaying, Engineering and Research | 14,096.45 | |
| Administration and Office | 24,145.80 | |
| Boarding House and Camp Maintenance | 22,974.56 | |
| Insurance and Taxes | 75,438.39 | |
| General and Legal Expense | 28,110.01 | |
| | $566,532.82 | .1208 |
| High Grade Mill, including Treatment of Ore on Hand | 99,271.79 | .0212 |
| Low Grade Mill | 30,917.42 | .0066 |
| Depreciation | 52,418.14 | .0112 |
| Custom Milling— | | |
| By Nipissing Reduction Co. | 38,176.51 | .0081 |
| By Nova Scotia Co. | 2,892.20 | .0006 |
| Marketing Product | 61,577.03 | .0131 |
| Corporation, New York Office and Traveling | 13,869.03 | .0030 |
| | $865,654.94 | .1846 |
| Less Rents and Interest | 50,374.99 | .0107 |
| Total Cost of Production | $815,279.95 | .1739 |

# THE WITWATERSRAND—THE CITY DEEP

By ROWLAND GASCOYNE.

**Transvaal.**

The City Deep mine is regarded as one of the coming mines on the Rand. Formerly this deep level area was not regarded with much favour, as several of the outcrop mines, notably the Spes Bona and New Goch have not been conspicuously successful, owing to the low grade of the ore, others like the Wolhuter, Meyer and Charlton and City and Suburban have excellent records. The work done by the City Deep has, however, disclosed a more than usually rich main reef leader, and the recovery values rank amongst the half dozen highest on the Rand.

Milling operations commenced just over two years ago, but during the short time that has elapsed since the stamps were first dropped, operations have not proceeded as smoothly as could be wished, either above or below ground. Many of the difficulties were trifling, but those underground were the most serious. The layout of the mine did not conduce to economical working, ventilation troubles arose, and, last, but not least, there was a chronic scarcity of native labour. These difficulties are being gradually overcome one by one, and at the time of writing 150 stamps out of 200 stamps originally erected have been got to work and last month the City Deep figured, by reason of its gold output, amongst the twelve leading gold producers in the Transvaal. vaal.

It was not until 1908 that by amalgamation with neighbouring mines that the City Deep assumed its present shape and importance, and to-day its total area is only one claim short of a round two thousand, a gold mining claim in the Transvaal measuring 154.95 English feet on the strike, 413.2 feet on the dip, being in area approximately 1½ English acres. The capital of the company is £1,250,000 in £1 shares. The company also possess an estate of over 3,500 acres upon which the workmen are offered building sites for the erection of their own dwellings on highly advantageous terms, with the object of inducing the white employes to settle, and not move from mine to mine as is usual on the Rand.

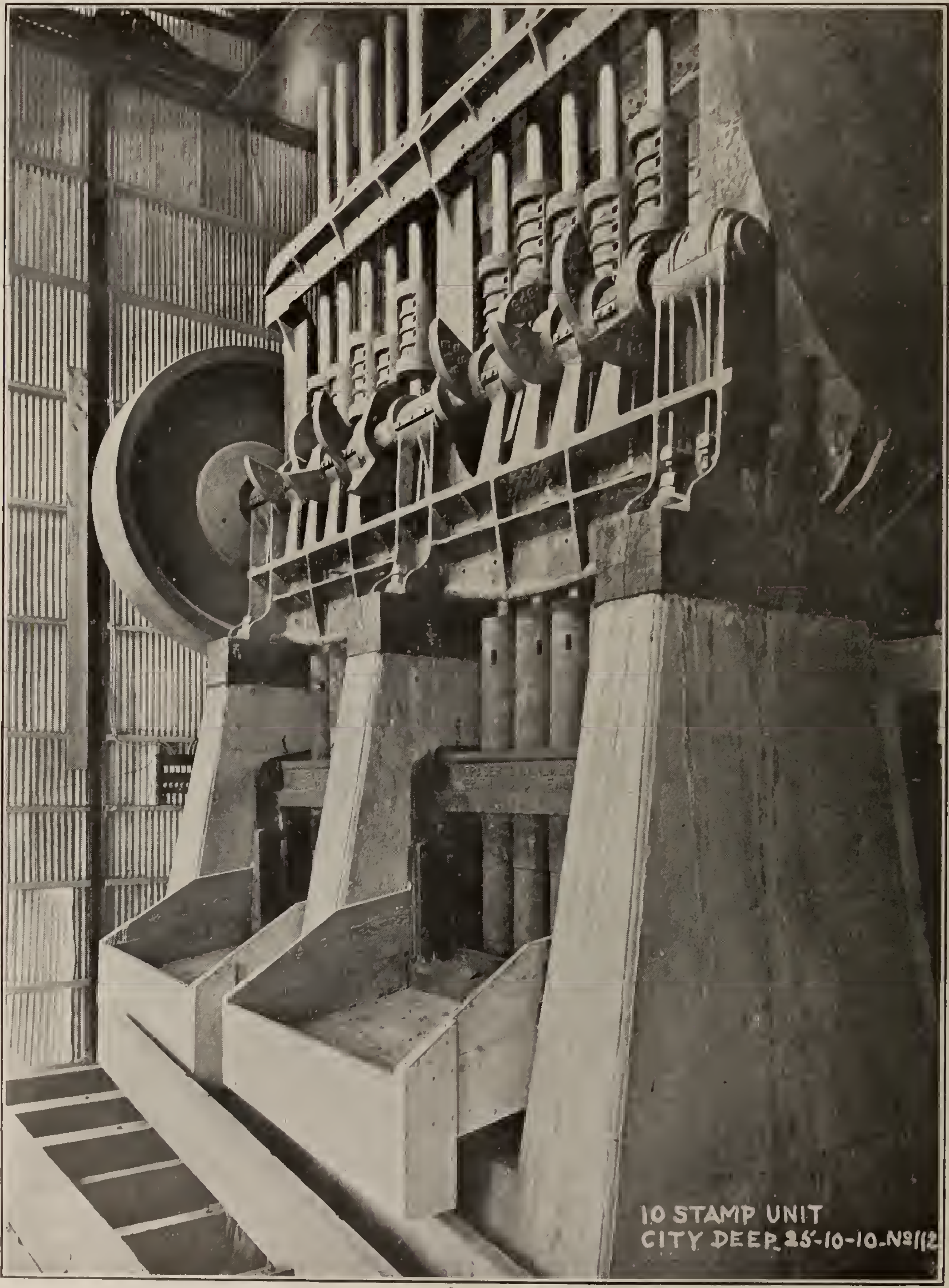
From east to west the property of the City Deep extends about two miles. Two vertical rectangular seven-compartment shafts have been sunk to the reef, each shaft measuring 44 feet by 8 feet in the clear. The No. 1, or eastern shaft, is 3,100 feet from the eastern boundary and 3,261 feet deep. Cross-cuts have been driven north from this shaft to strike the reef on the 8th and 9th levels, and sinking has been resumed with the object of striking the reef at a vertical depth of a little over 4,000 feet. 4,400 feet further west is the No. 2 or western shaft, where the reef was struck at a depth of 2,876 feet. This shaft is situated about 3,500 feet from the eastern boundary. It is the rule on the Rand to place the shafts considerable distances apart, a practice which has many disadvantages as regards ventilation, particularly before the shafts are connected, the value of which has only been recently recognized.

What is known as the main reef leader is the principal reef, little work having so far been done on the main seef or south reef, although it is possible that as in some of the neighbouring mines both these reefs may be drawn upon in the future. Several miles of driving on the main reef leader show that it is wonderfully consistent, both in width and values, the average width running twenty inches and the assay value twenty-two dwts. of gold to the ton. The reefs dip south at an angle of 38 degrees, the distance between the south reef and main reef leader varying from 60 feet to 80 feet, the main reef leader being apparently thicker in the eastern than in the western section of the property.

**No. 2 Shaft, Sorting and Crushing Station.**

The two shafts are situated about 2,000 feet south of the northern boundary of the property, thus leaving a larger area than usual to the rise which is worked through cross-cuts from the shaft. The proposed method of working is to drive main collecting levels 1,000 feet apart, designed to be fed by inclines from the dip by chutes from the rise. These main levels are at present worked by mule traction, but petrol locomotives are being fitted together on the property, with the object of displacing mule transport. They are of single cylinder horizontal type, 9-inch diameter, 12-inch stroke, horse power 25 to 30. The main levels are laid with a double line of heavy rails, the ore being conveyed to large ore bins at the shaft built of re-inforced concrete, and fitted with Kimberley chutes for rapidly loading the skips.

gear pulleys 16 feet diameter. The skips carry 5 tons, maximum speed of hoisting, 3,000 feet per minute, so that each hoist can raise 165 tons per hour. There is also an electric man hoist, three-phase type, driven by a 1,600 h.p. motor operated by power at 2,100 volts 50 cycles. The braking arrangements of this man hoist




**Californian Stamps**

are interesting. In addition to the usual post brakes worked by compressed air, there is an "eddy current" brake, the direct current being obtained at 120 volts from a rotary converter in the engine room or alternately from a storage battery. The drums are of cast steel, 11 feet diameter and 4 feet wide, each drum carries 4,200 feet of rope. The man cages are of the

It was intended to use electric power purchased from the Victoria Falls Co., exclusively, but as such was not available when wanted, a boiler plant of nine boilers was installed at No. 2 shaft. The hoisting plant consists of two double compound tandem Whiting hoists, with 17-inch and 28-inch cylinders and 5-ft. stroke. Driving sheaves 12 ft. diameter, ropes 1½-inch, head-three-deck type for carrying 20 men on each deck. Synchronous speed of motor 100 revolutions per minute giving a rope speed of 3,500 feet per minute.

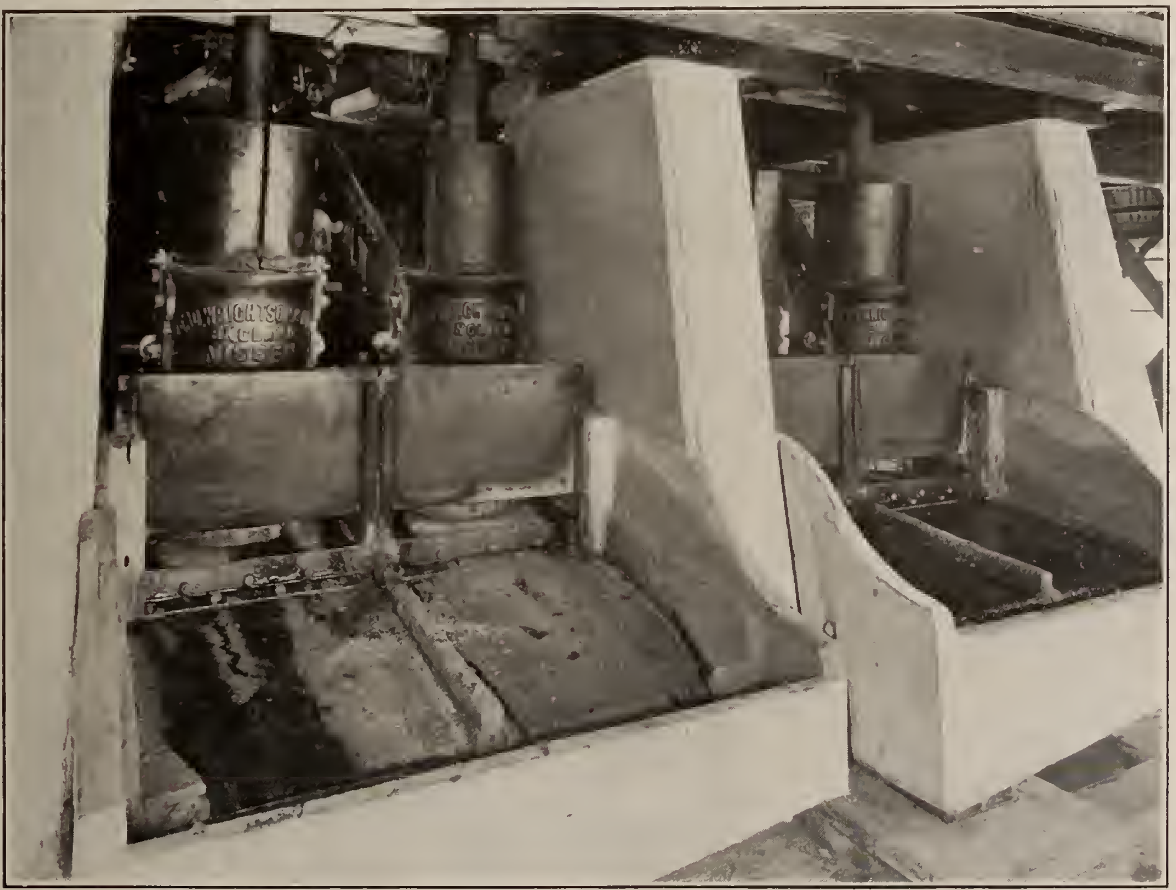
Both compressed air and electrical power are purchased from the Victoria Falls and Transvaal Power Co., the former being delivered at 110 lbs. per square inch, the electrical power by underground cables to sub-stantions at a pressure of 20,000 volts and transformed to 2,100 and 525 volts as required. There are some 120 motors on the property, aggregating 7,500 h.p. They vary in size from 3 h.p. to 1,600 h.p., those of 40 h.p. and over working at 2,100 volts and the smaller ones at 525 volts.

All the sorting and crushing at present is done at No. 2 shaft, the ore being passed over 1½-inch grizzlies and the fines conveyed direct to the crushed ore bin by a 24-inch belt, the coarse ore passing to four 36-inch. conveyor belts and washed by sprays to facilitate sorting, the waste being thrown on to the return side of belt. The sorted ore passes to twelve 30-inch by 12-inch Blake crushers, adjusted to give a product approximately 2-inch cube. Each crusher is driven separately by a 60 h.p. motor. The crusher ore bin is built of re-inforced concrete, fitted with doors worked by compressed air and has a capacity of 1,000 tons.

Forty-ton hopper trucks convey the crushed ore to the mill bin hauled by electric locos. Each loco consists of two units driven by a 150 h.p. motor of the three-phase type, the power being supplied through "buffer" transformers to overhead lines and eath.

The mill, originally of 200 stamps, has now 190 Californian and 4 Nissen stamps. The Californian stamps have a dropping weight of 1,650 lbs. and the Nissen stamps 2,000 lbs. The mill is arranged in units of ten stamps each, driven by a 50 h.p. motor. The outstanding feature of the mill as originally designed is the absence of wood, the king posts being constructed of cast steel. The mill, when in full operation, is estimated to deal with over 60,000 tons per month, at present only 150 out of the 194 stamps are at work.

The pulp on leaving the mill is lifted by 12-inch Robeson-Davidson centrifugal pumps to the tube mill cone thickeners. The cones are of diaphragm type, fitted with auxiliary cones to arrest any coarse material in the overflow. There are nine tube mills 22 feet by 5 feet 6 inches diameter, driven direct by 100 h.p. motors, the speed reduction being effected by Citroen gearing. The amalgamating tables and extractor boxes are all under the same roof. The amalgamating tables are fixed and dip at an angle of 8 degrees about two-thirds of the total gold recovered being in the form of amalgam. The extractor boxes are divided into six compartments and built of steel. Zinc-lead couple method of precipitation is used.

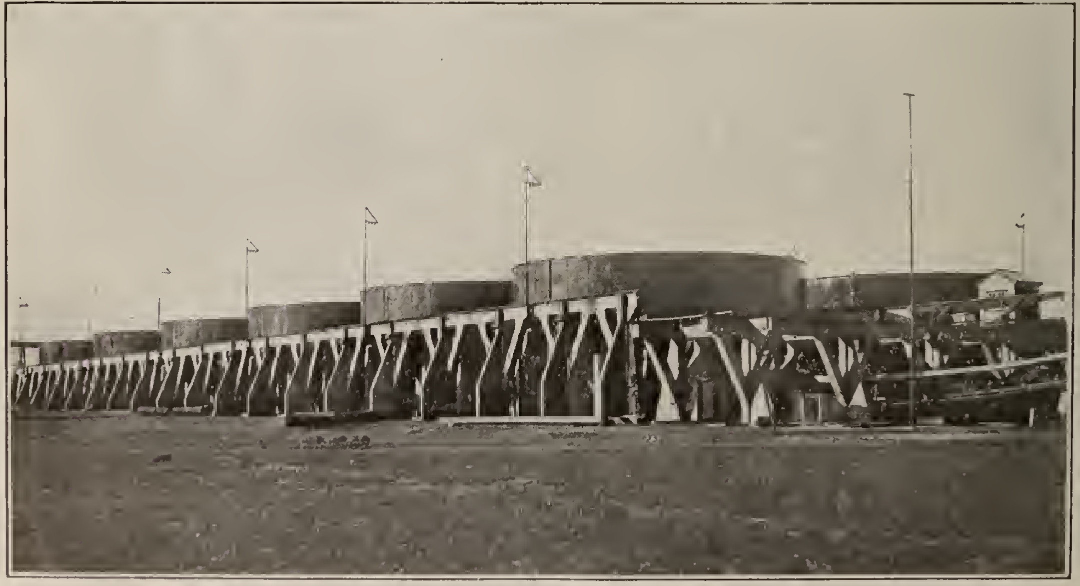


**Nissen Stamps**

After amalgamation Robeson-Davidson pumps are again used to elevate the pulp to the classifiers, the coarse going again to the tube mills and the fines to the sands collector tanks, each of a capacity of 800 tons. The collecting tanks are built of reinforced concrete on similar material for the foundations, the overflow passing into a series of cones where the sand is returned for classification to the tailing pumps, the slimes passing on to the slimes plant. The sand, after draining, is discharged by a Blaisdell excavator and then conveyed by belt to the sands treatment plant consisting of twelve steel tanks on re-inforced concrete foundations. On completion of treatment the sands are discharged by another Blaisdell excavator into trucks and transferred by mechanical haulage in the ordinary way to the residue dump. When milling operations first started the stailings were conveyed to the dump by a Bleichert transporter, consisting of cantilever fitted with conveyors. This method of transporting the tailings to the

**Sand Treatment Plant**

residue dump proved so expensive in use, repairs, and maintenance, that after a few months' use it was abandoned in favour of the common practice of using mechanical haulage. The slimes are treated by the ordinary decantation proecess. There are six collecting



**Sand Collection Plant and Blaisdell Excavator**

tanks each 60 feet in diameter, and eight treatment tanks of 70 feet diameter. There are also two Brown agitator tanks in which the slimes pulp is aerated with compressed air.

The general progress at the City Deep has been far less rapid than was expected on the completion of the mill. The Victoria Falls Power Co. found that it was quite impossible to meet the requirements of the mines of electrical power and compressed air at that time, the City Deep had perforce to instal steam plant as a substitute. This, of course, meant some delay, inconvenience and loss, milling operations starting first with 50 stamps only. Some little trouble was caused by the new ideas introduced in the structure of the mill, but more serious trouble was met with underground, owing to the faulty method of opening the mine and ventilation drawbacks. By far the greatest drawback, however, was the chronic scarcity of native labour with the result that to-day although the native labour scarcity has been almost removed, only 150 stamps out of a total of 194 are at work. It has taken the company two years since milling operations, instead of one year, as expected to reach the dividend-paying stage, owing principally to the scarcity of native labour.

The progress made since the start of milling operations is shown in the following figures:

| Year. | Stamps. | Tons milled. | Revenue. Amount per ton. £ | s. | d. | Expenses. Amount per ton. £ | s. | d. | Profits. Amount per ton. £ | s. | d. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1911 | 90 | 349,713 | 537,548 | 30 | 9 | 406,634 | 23 | 3 | 130,914 | 7 | 6 |
| 1912 | 123 | 479,530 | 852,039 | 35 | 6 | 567,158 | 23 | 7 | 292,600 | 12 | 2 |

There is developed sufficient payable ore in the mine to last the mill when fully employed at least four years. With regard to the life of the property all will depend to what extent the milling operations are extended. In the present mining area there must be at least 30,000,000 tons of ore available for the mill sufficient to last the present mill when fully at work, say 30 years, so that if milling operations be considerably extended there ought to be reckoned at least a life of 20 years for present mining area, whilst the additional available mining ground to the south makes the definite calculation of the life of the property impossible.

# DOMINION OF CANADA ORE DRESSING AND METALLURGICAL LABORATORY

The Mines Branch of the Department of Mines has installed at Ottawa a modern well-equipped laboratory for purposes of experimental concentration and metallurgical tests with Canadian ores and minerals.

The following lists of full scale and laboratory size apparatus will convey some idea of the magnitude and latitude of the plant.

## STANDARD SIZE MACHINERY.

### Crushing and Screening.

One Hadfield and Jencks 12 in. × 8 in. Blake crusher.
One Allis-Chalmers 24 in. × 14 in. "Style C" rolls.
One Hardinge 4 ft.—6 in. conical ball mill.
One Ferraris 6 ft.—0 in. screen for coarse sizing.
One Keedy ore sizer, No. 3, for fine sizing.
One Pnplex Callow screen.

### Sampling, Recording, Etc.

Sampling is provided for by two Standard Vezin machines, placed in favourable position to cut out preliminary samples of coarse materials. The fine material will be sampled by an eight unit system of the Flood automatic samplers.

Provision has also been made for hand sampling by means of the Jones riffled samplers.

All water lines serving standard apparatus will be equipped with Keystone water meters, to enable the keeping of accurate records of water consumption.

### Amalgamation and Concentration.

One Allis-Chalmers 5-stamp battery, with 1,250 pound stamps, equipped with a 10-ft. tilting amalgamating table, followed by a Pierce amalgamator. The mortar of this mill may be, if so desired, arranged for inside amalgamation.

Six Callow tanks, 8 feet diam., for de-sliming and settling.

Two Richards pulsator classifiers, launder type.

One Overstrom sand table.

One Deister slime table.

One Richards pulsator two-compartment jig.

One tandem unit Grondal magnetic separator, for wet separation of strongly magnetic minerals.

One Grondal magnetic cobber, with dust collector for dry separation of strongly magnetic minerals.

One Ullrich four pole magnetic separator, for either dry or wet separation of weakly magnetic minerals.

One Huff electrostatic unit, comprising a standard generator and two laboratory size separators.

### Small Scale Apparatus.

One Sturtevant 2 in. × 6 in. laboratory crusher.

One Sturtevant 8 in. × 5 in. laboratory rolls.

One Sturtevant 12 in. × 24 in. laboratory screen.

One Braun planitary pulversizer.

One Abbe six jar pebble mill.

One Gyratory screen (Hoover type), for making dry screen analyses with nested screens.

One Richards combined laboratory pulsator jig and classifier, with glass side.

One Grondal laboratory magnetic separator, for either dry or wet separation of strongly magnetic minerals.

One Wilfley table, 24 in., laboratory size.

One laboratory cyanide plant of 200 pounds capacity, consisting of a Parrel agitator and air pump, with the necessary solution, zinc, and sump tanks.

Two laboratory filter presses.

One complete set of I. M. M. standard screens.

One complete set of Tyler standard screens, after the Rittinger scale.

The installation of an experimental roasting and sintering plant will be undertaken some time during the year.

The plant will be operated free of all charges, including assays necessary for test purposes, on Canadian ores, under the following conditions:

(a) Samples must be bagged and delivered to the plant free of all transportation and unloading charges.

(b) For small scale tests, not less than 200 pounds will be accepted.

For large scale tests, not less than 5 tons will be accepted.

(c) All testing products are to become the property of the Mines Branch, unless otherwise arranged before commencement of tests.

(d) Reports of tests will be incorporated in the publications of the Mines Branch, but single copies will be given to owners of samples when their tests are completed.

Under ordinary conditions tests will be made by the Mines Branch officials, but arrangements may be made be made whereby engineers or other competent persons may supervise their own experiments.

It is expected that the plant will be ready for operation by the first week in July, 1913.

All communications regarding arrangement of tests should be addressed to

EUGENE HAANEL, Ph.D.,
Director Mines Branch,
Dept. of Mines, Ottawa.

# A NOTE ON THE COMPARATIVE EFFICIENCIES OF COMPRESSED AIR VERSUS HYDRAULIC POWER FOR MINING OPERATIONS*

By G. A. Denny.

I have been invited by the Council to contribute a paper to the Institute, which may serve as a type of the communication which the Council specially desires to obtain, namely, short papers dealing with subjects particularly adapted for discussion.

My aim in the following note will be, I believe, perfectly patent to my colleagues. No attempt is made to support by more than generalizations, the statements made, the object being to supply a skeleton around which useful and informing discussion may build a body of opinion and experience, which will be instructive to us all.

In choosing the subject of compressed air transmission, I have especially in mind, that it is one in which we are all interested, and all have more or less costly experience. Morever, it is a branch of our mechanical operations—invaluable and essential though it may be despite its deficiencies,—which offers an excellent target for the critic purposely seeking only its misdeamours, in order to invite discussion in its defence.

In a similar spirit, but from an opposite stand point, the benefits of hydraulic transmission are touched upon, with the intention of provoking critical discussion.

The problems of air compression and transmission are as numerous as they are complex. Pressure, temperature, and volume, have an interchangeability of relationship, which whilst fully covered by theoretical formulae, are most elusive in habit, and unsubmissive to theoretical demands in every day practice.

Our definitions of free air, generally apply to pressures of one atmosphere at sea level, or 14.7 lbs., and 60 deg. temgerature F. But what infinity of variation is there from those bases. Every latitude, every elevation, almost all specific localities, have their own peculiar involutions of volume, temperature and pressure, each new combination giving rise to relationships singular to themselves. Absolute temperatures, must be considered in all cases, whether dealing with free or compressed air, as weight and pressure will vary in accordance with the absolute temperature of the original volume, the latter also suffering variations in conformity with the rise or fall of the absolute temperature. At 30 deg., or 491 deg. absolute, a cubic foot of dry air at sea level and average atmospheric pressure weighs .0811 of a lb., and the volume of 1 lb. at this temperature and pressure, is 12.336 cubic feet. At 90 deg. F.—absolute 551 deg.—a cubic foot weighs .0722 lbs., with a volume for 1 lb. of 13.853 cubic feet. At 200 deg.—absolute 661 deg.—a cubic foot weighs .0602 lbs., with a volume of 16.907 cubic feet.

The relationships of temperature, pressure and volume have been succintly stated as under:

1. The absolute pressure of air, varies inversely as the volume, when the temperature is constant.
2. The absolute pressure varies directly as the absolute temperature, when the volume is constant.
3. The volume varies as the absolute temperature, when the pressure is constant.
4. The product of the absolute pressure and the volume is proportional to the absolute temperature.

*From the Bulletin of the Mexican Institute of Mining and Metallurgy.

When air is compressed, an increase of temperature takes but not proportionate to the pressure, nor will air which is taken into the cylinder at zero, have a temperature increment similar to air which is taken in at 100 deg. At two atmospheres gauge pressure, for instance, air of an initial temperature of zero, will have risen to 170 deg., whilst air of an initial temperature of 100 deg. will have risen at the same gauge pressure to 320 deg. In the higher pressures, the rate of temperature increase is much lower. For instance, air of an initial temperature of 100 deg. will only rise about 20 deg. between gauge pressures of 21 and 23 atmospheres.

The importance of the question of original temperature of the free air, cannot be overestimated, since that volume of free air which we take into the cylinder, is in the last resort the unit we have to count upon for work. If the air is so heated at the moment compression begins, that its volume is increased by say 20 per cent., we are actually reducing the capacity of our machine—from a basis of cool air—to that degree, and have to exert as much power for the compression of an 80 per cent. cylinder charge, as would be required for an 100 per cent. charge of cooler air.

Even when every precaution has been taken to provide the coolest and cleanest supply of air available, to the compressor, we still have the heated condition of the air cylinder itself to contend against, which causes an immediate rise in the temperature of the entering air, reduces the volume, and deprives us of a fixed, but unascertainable amount of eventual energy. No determination has ever been made of the exact rise in temperature of the entering air, in any given instance, nor does it appear likely from the nature of the case, that it will ever be accurately fixed, as the indicator gives us no information on the point.

The safest way to minimize losses in this direction is to lead the air into the cylinders from cool places, in channels or conductors of wood or concrete, or other material which is a bad heat conductor or radiator.

Having the air in the cylinder, we now proceed to reduce its volume and increase its pressure. If this could be done without creating heat, the air would conform to the ordinary law of gases, namely, that its volume would vary inversely to the pressure, and a diagram of the operation in the cylinder would give us an isothermal compression line. In that case (if it were possible), assuming the air to be originally at one atmosphere pressure, sea level, and 60 deg. Fah., and that we have compressed it to 80 lbs. gauge pressure, the original volume of air taken at 1, would be reduced to .1552, and the mean pressure per stroke would be 27.33 lbs.

It is well to keep these ideal conditions in mind, in order to see how far short of them our actual practice falls.

In the same conditions as above, and assuming no air cooling, the volume of air after compression is .267 of the original unit, and the mean pressure per stroke 36.6 lbs. That is to say, in practice, where no cooling arrangements exist, we require 34 per cent. more power for the air compression, because the volume of air has been increased by heat. In the best practice, with all the cooling arrangements possible, or practicable, a result somewhere between the two figures is attainable. The methods of air cooling that have been tried are three, namely:

1. Water jacketing of the cylinders.
2. Water spraying in the compressing cylinder.
3. Cooling in a special apparatus between the compression stages.

As we are treating at the moment of only single stage compression, the first two are all to which we need refer.

Of the two systems under notice, that of water jacketing, is the one almost universally adopted. In this system, however, the cooling effect is at best, very ineffective, since the inner surface of the cylinder can only be slightly cooled, and can, therefore, only effect a film of adjacent air, leaving the large bulk of air, in the central portion of the cylinder almost untouched. For this reason cylinders of small diameter must allow of better cooling than large cylinders, but other mechanical considerations will out weigh this advantage, where a large output is required. The practice of water spraying in the compressing cylinder has almost been abandoned. The practical objections to it are:

(a) That it produces very moist air, which freezes in expanding, and blocks the exhaust passages of pumps, etc., with ice;

(b) That it necessitates very large clearances in the cylinders and restricts operations to comparatively low piston speeds;

(c) That it gives rise to serious difficulties in the lubrication of the cylinder; increases friction; induces excessive cylinder wear, and reduces efficiency.

If it were possible to utilize the heated air immediately, without loss in volume due to cooling, we should not have to deplore the large power losses represented by the difference between isothermal and adiabatic compression. But in practice the air after compression is discharged into receivers and pipe lines, and returns more or less to its original temperature, with a corresponding shrinkage in bulk, and with lessened energy possibilities. Attempts to restore in part the lost energy due to volume shrinkage, are made by reheating the air, near the point at which it is to be used, but it may be said in general, that no reheating apparatus finds a place in mining installations, and therefore no recovery of the loss due to adiabatic compression is made.

It is perhaps well to emphasize the fact that an air compressor has two quite separate and distinct functions to perform, namely:

(a) That of increasing the pressure of the air from a pre-existing to some determined pressure;

(b) That of discharging the air of a determined pressure into the mains.

We have seen that the admission of the maximum volume of cooled air into the cylinder is the first desideratum in the process of increasing pressure, since the capacity of the machine is reduced, and power is wasted in proportion to the temperature of the air above a certain practicable minimum.

Similarly with the discharge. As the volume of air, owing, firstly, to the admission of warm air, and, secondly, to the heat generated by the compression, will have greatly increased, the power required for its discharge will be proportionate to the bulk of air discharged. If at the moment compression begins, the air has a temperature of 60 deg. and if it were compressed, insolthermally, or .3144 if adiabatically compressed, and the temperature in the latter case would be 375 deg. In this instance, the volume of air after compression has a bulk 60 per cent. greater than it would have had if the air had been kept down to a temperature of 60 deg. Again if the air at the moment of compression had a temperature of 80 deg., or 20 deg higher than before, and were compressed to 80 lbs. gauge, its final volume would be .1552 isothermal, or 267 adiabatic, and the temperature in the latter case would be 432 deg. Here the air after compression has a bulk of over 71 per cent. greater than it would have had, could the isothermal conditions have been realized. In order to discharge the increased bulk of air, therefore, we require over 71 per cent. more power than would be necessary if the temperature of the air could be retained at 80 deg. F. throughout the operation.

The horse power required to compress 1 cub. foot of free air to a pressure of 80 lbs. adiabatically is .184 of a h.p., and the power necessary for the discharge of 1 cubic foot of the compressed air into the receiver, is 1.85 h.p.

The important practical considerations in the figures just given are that:

(a) The air is not in a condition to be applied to our purposes, until we hace expended a considerable amount of power in the reduction of its volume.

(b) The power required for the discharge of the air is to a large extent wasted, because in the conditions we have taken, we must discharge a bulk of 1.71 units of heated air, which, after cooling, becomes only one unit available for power.

We may examine, further, in the light of the foregoing statements into the pneumatic efficiency of the compressor.

If a normal diagram from a single stage compressing cylinder be examined, it will be seen that it is exactly the opposite of a steam cylinder diagram; steam admission being represented by air delivery; steam expansion by air compression; and steam compression by the air re-expansion line. An interpretation of a normal diagram from a single stage machine compressing free air at 60 deg., to 80 lbs. gauge, will show that the work done may be divided as under:

(a) Work done in raising air pressure;

(b) Work done in excess due to heat;

(c) Work done in expelling compressed air to the receiver.

These operations may be expressed numerically as under, having reference to one stroke of the piston:

1. .734 of the stroke used, at a mean effective pressure of 20.5 lbs. for bringing the air from atmospheric pressure to 80 lbs. gauge, or .734 x 20.5 equals 23.911 stroke pressure units.

2. The excess bulk due to heat is 71.4 per cent., and the volume of compressed air at 60 deg. is .1552 of the original volume. Therefore the excess work done due to heat is .714 of .1552 or .1108 of the stroke, at the delivery pressure of 80 lbs., or .1108 x 80 equals 8.864 stroke pressure units.

3. The part of the stroke which furnishes us with power in the receiver, that is for our purposes, the really useful portion of the stroke, is that proportion of it which is required to expel the volume which the compressed air will occupy when cooled, namely, .1552 stroke working against a pressure of 80 lbs. or .1552x80 equals 12.416 stroke pressure units.

We thus have for the total stroke an aggregate of 36.327 stroke pressure units.

The only portion, however, as before stated which provides us with air at working pressure is that referring to the discharge, namely, 12.416 units, the remainder being losses in bringing the air up to pressure, and in heat. That is to say, we get a useful result only from 34 per cent. of the power put into the work, and 66 per cent. may be reckoned as loss. Apart from, and in addition to this loss, are the losses inseparable from the machine, as such. To begin with, the volume of air compressed is never the full contents of the cylinder, since there is clearance to be reckoned with, and lateness in reaching full atmospheric pressure, on the admission side. The mechanical losses may be put down at 10 per cent. for the friction of the machine, 10 per cent. for losses due to increased temperature of the air after admission, 10 per cent. for losses due to clearance, leakage, valve resistance, etc. This leaves 70 per cent. only available for air compression, and of this available amount of power, we have seen that only 34 per cent. does useful work. Then 34 per cent. of 70 per cent., or 23.8 per cent. is all the useful effect we get, expressed in terms of air delivered to the receiver.

We have so far dealt with figures relating to single stage compression, and the question now arises, as to what extent the losses in single stage practice will be minimized by double stage compression.

The sole object of double stage compression is, of course, the avoidance to the greatest extent practicable, of the heat losses, by cooling the first stage air, before it enters the second stage cylinders.

Below are the figures so far as they relate to temperatures, of an actual test. The test was made upon a horizontal cross compound two-stage compressor, with suction air valves mechanically operated, delivery valves of automatic design to close in equilibrium, air cylinders water jacketed both on barrel and ends, intercooler between the cylinders.

| | |
|---|---|
| Temperature of air at instake .......... | 81.6 F. |
| Temperature of air low pressure delivery. | 252.1 F. |
| Temperature of air intercooler ........... | 148.2 F. |
| Temperature of air high pressure delivery. | 262.4 F. |
| Pressure of air in intercooler ........... | 34 lbs. |
| Pressure of air in receiver .............. | 91.7 lbs. |

It is interesting to note the effect of the jacket cooling on the air of the low pressure delivery. The final temperature of the air, without any jacketing would be 310 deg. F. therefore the jacketing has lowered the temperature only 58 deg. and has affected the volume of air, therefore, to a very limited extent.

If isothermally compressed, the volume of air would be over 30 per cent. less than the adiabatic volume, showing that the water jacketing in this case has given far from an effieient result.

Turning now to the intercooler, we find that it lowered the temperature of the air by 104 deg., but still the air had a temperature of 148.2 deg. or 66.6 higher than the original intake, and the capacity of the delivery cylinder would be prejudiced and its useless power increased proportionately to the excess volume occupied by the heated air. The complete cooling which is often claimed in the intercooler, was therefore far from being realized in this instance.

It is still a matter of opinion amongst many of the best informed engineers on this subject, whether for ordinary working pressures, say up to 80 lbs. gauge, there is any advantage in double stage practice. In a booklet published by a well known maker of compressors, the following statement is made.

"The very processes of compounding may too easily lead into mechanical difficulties which in the aggregate, may not only counterbalance the gain by compounding, but may actually swing the balance in the other direction, and result in a machine of lower efficiency, as compared to the single stage machine of the best class."

Following upon the losses incident to the compression and delivery of compressed air to the receiver, we have the losses in the pipe lines and in the machines which utilize the air for power purposes. Theoretically the losses in air mains should be very low, given perfect conditions, and not great distance, but in ordinary mining practice, there is no question that they are frequently very high. A test made under my own supervision in a large South-African mine, showed that the receiver and pipe line, losses amounted to 11.5 per cent. of the indicated horse power of the engine. This loss is, of course, made up mainly of two components, friction and leakage, in what proportions could not be determined. It is probable that 10 per cent. would be a fair figure to adopt for leakage and friction in the ordinary mine installation.

We have now to consider for a moment what efficiencies are obtained from compressed air in ordinary mine usage. Rock drilling and pumping are perhaps the principal applications of compressed air power in mines, though it is used for a variety of other operations such as hoisting, signalling, ventilating, etc.

Considered as an engine, the ordinary rock drill is not an efficient machine, since it uses air at full pressure throughout the piston stroke. The average drill develops about 1.5 h.p. In order to obtain this power, it has been proved by test that the steam engine working the air compressor must develop anything from 25 to 32 h. p., so that the overall efficiency of the system is terms of power at the rock drill bit is in the neighbourhood of, say, 5 per cent. It seems incredible, that rock drilling operations are so inefficient, but it is nevertheless true, that the above rate is probably representative of the large majority of mine installations.

Pumping by compresser air is largely resorted to in mines because of its convenience, or expediency, or both. On a test made under my own supervision on a large mine, in which all the auxiliary pumping was done by compressed air, using 7 pumps, the efficiency of the pumps as a whole, on the original power put into the compression, worked out at between 9 and 10 per cent. The pumps used were the ordinary steam pump, in which all losses due to clearance and unsuitability for the pressure used, were greatly exaggerated. Still they represent average practice in this respect, and the losses, similarly to those occurring in rock drilling, are so high as to seem almost incredible.

I have said enough, I think, about the losses incident to the generation and use of compressed air, to stir up a vigorous defence amongst its champions, from which we must all benefit.

In contradistinction to the losses involved in an air compressing and transmission system in its application to rock drilling I will now state very briefly the features and advantages of hydraulic transmission for a similar application.

The outstanding difference between air and water from the point of view of power development and transmission is, that water is non-elastic.

Unimportant as this apparently simple difference is on first view, it will be found on closer examination to describe practical immunity from nearly all the heavy losses incident to air transmission and compression, as under:

1.—There is no initial capacity loss due to increased temperature after admission to the working cylinder.

2.—There is no complicated and expensive mechanism required in developing power, whether the head be gained by artificial or natural means, and there are no large friction losses.

3.—There are no heat losses.

4.—No power is required for the preliminary compression, and in consequence, instead of suffering the tremendous losses incident to the process of bringing the water up to working pressure, all the power is utilized in discharging it into the pressure mains. The importance of this is better appreciated, when we state that one unit volume of water at 1,000 lbs. pressure allowing 5% for cylinder and other losses, would transmit 95,000 volume units of pressure, whilst one unit volume of air compressed to 80 lbs. gauge, owing to the small percentage of the stroke available for delivery to the mains, would not transmit to exceed say 2,000 volume units of equal pressure.

5.—There are no clearance losses.

6—With extremely simple mechanism very high working pressures from 500 to 1,000 lbs. and upwards per square inch may be developed.

7.—At working pressures such as mentioned in the previous paragraph, the transmission losses are negligeable, and the volume of water required, and the hydraulic mains are very small.

The overall efficiency of a hydraulic system, in terms of power delivered to the hydraulic drills would not be less than 80%. The efficiency of the drill would range, according to the type employed from say 60% to 80%. Therefore the over all efficiency of the entire system would not be less probably than 50%.

On the same basis, the efficiency of a steam driven compressed air system will not exceed 6%.

Mexico is a country of water powers, and potential hydraulic transmission projects. In view of the great advantages offered by hydraulic transmission and and hydraulic drills, it is greatly to the interest of the mining community, to make most careful enquiry into the possibilities of adopting it.

Where natural fall is not available for pressure purposes, a pump of comparatively simple and efficient type is all that is required to develop any working pressure desired.

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# GRANBY CO'S. OPERATIONS

The Boston Commercial has published the following information concerning the operations of the Granby Consolidated Mining, Smelting and Power Co., Ltd.

The Granby Consolidated Co. produced 5,539,419 lbs. of copper during the first quarter of the current year and made a net profit of about $194,000. The production by months compares as follows:—

| | Copper. lbs. | Silver. oz. | Gold oz. |
|---|---|---|---|
| January. . . . . . . . . | 1,792,245 | 23,952 | |
| February. . . . . . . . . | 1,779,212 | 24,645 | 3,430 |
| March. . . . . . . . . . . . | 1,967,962 | 28,352 | 4,211 |
| Total for 3 months. | 5,539,419 | 76,949 | 10,907 |

It is understood that the grade of the ore at the Phœnix property improved somewhat during the past month or two. This has offset to some extent the lower prices received for copper and the slightly increased mining costs resulting from interrupted operations in February, chiefly due to inclement weather.

The March run of the smeltery was a record breaker with the full battery of eight furnaces operating for 31 days, as compared with a 20-day run in the preceding month.

Construction work at the Hidden Creek property is well under way, with foundations being laid for the various buildings.

Mr. William H. Nichols, President of the Granby Co., issues the following report to the stockholders:—

"Since the last quarterly report, January 22, 1913, the forward policy of the company recommended by the directors has been adopted by the shareholders and the company is in position to avail itself of any opportunities which conservative judgment may dictate ant at the same time to push to completion the work already undertaken, and resume payment of a moderate dividend out of the profits from current operations.

"At Anyox the work laid out has steadily progressed without any disappointment to, although some construction work was somewhat hampered by the winter snows which have been quite unusual for that region. Our engineers, however, still expect to have the works in condition to operate in November and December of this year.

"The operations of the Phœnix mines and Grand Forks smeltery for the month of March showed a profit of $87,770, and for the nine expired months of the fiscal year, to March 31, $990,255. The yield of metals has been fully maintained, and the cost of copper for March slightly reduced, but current profits for a portion of this period were interfered with by the decline in the price of copper. All figures are now based on copper at 14½ cents, and on March 31 we had on hand 1,935 tons taken in at that price.

"Reports from the development work of the old properties indicate that ore reserves there have been fully maintained."

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Mr. Alex. H. Smith is expected to reach Toronto early in June.

Mr. A. A. Hassam is examining the mine of the Boston and Goldenville Gold Mining Company at Shiers Point, Nova Scotia.

# ANNUAL REPORT OF THE BRITISH COLUMBIA CO., LTD.

The annual report of The British Columbia Co., Ltd., for the fiscal year ended December 31, 1912, follows:—

### President's Report.

Mr. Newman Erb, President of the company, reported as under:

"The report of the Acting General Manager, with Auditors' Certified Balance Sheet, and Profit and Loss Account, for the fiscal year ended December 31, 1912, is herewith respectfully submitted by your Board of Directors.

"The results of operations include the month of December, 1912, by reason of a change made in the fiscal year, as a matter of convenience, to correspond with the calendar year, and the reports therefore cover a period of thirteen months.

"The quantity of ore treated at the company's smeltery was 740,589 tons, of which 443,022 tons was derived from the company's mines, the remainder having been custom ore. Metals were: Fine copper, 11,146,-811 lb.; silver, 142,025 oz.; gold, 25,863 oz. The proceeds of these metals amounted to $2,483,663.96.

"The net results of operations were $425,985.40, being the largest in the history of the company. From these profits there were paid during the period covered by the reports, two dividends, Nos. 4 and 5, aggregating $177,512.70.

"During the fiscal year the company paid on account of new properties and in their exploration and development, $229,489.46. Because of the great importance of supplementing the ore reserves of your company, as has been referred to in previous reports, and in furtherance of the the policy adopted, options, through bonds, were taken upon a number of properties which your operating officials believed were of sufficient promise to justify exploratory work. These consisted of the following, all in British Columbia, and were considered properly tributary to the company's smeltery:

1. Ada B. group, in Princess camp.
2. Silver Dollar claim, in Princess camp.
3. Annie L. claim, in Princess camp.
4. Princess Maud claim, in Princess camp.
5. Red Eagle claim, in Princess camp.
6. Triangle Fractional claim, in Princess camp.
7. Eureka group, near Nelson.
8. Queen Victoria group, near Nelson.
9. L. H. group, near Silverton.
10. Riverside group, on North Fork of Kettle river.
11. Copper Mountain district.
12. Greyhound mine, Deadwood camp.

"The development on Nos. 1-9 of the foregoing, on which $57,918.39 was expended, proved to be so encouraging that the company concluded to acquire them and made payments, on account of the option bonds, amounting to $21,000. On the last two very extensive explorations were conducted, but further development was, for the time being, abandoned. The company, however, acquired one-half interest in the Frisco and thirteen other claims in the Voigt camp, on Copper mountain, and subsequently acquired a mortgage which covered the other half interest on these latter claims, which are all embraced in the Copper Mountain district.

"Indications are that in the Princess camp the company will develop a copper mine of considerable extent and value, and the work still in progress is intended to determine the extent of ore-bodies and the method of their treatment. It appears the products of these mines can be successfully concentrated and, if so, profitably transported to be treated at the company's smeltery. The exploration work under way at the close of the fiscal year will be continued.

"During the year under review the company has added to its holdings of New Dominion Copper Co. securities bonds of the par value of $237,675, which cost $122,249.25.

"Operations for the fiscal year were on the whole encouraging and satisfactory. With the opening of the new mines and the completion of the plans now under way for supplementing the ore reserves, which appear to be assured, it is believed stability will be given to the company for the future.

"The management desires to express its obligation to the operating force, and to the intelligent co-operation, fidelity and zeal of its officers, for the results obtained during the year."

### Acting General Manager's Report.

Mr. Frederick Keffer, Acting General Manager, reported as follows:—

For the fiscal year of thirteen months, ended December 31, 1912, the following review of the company's operations is submitted:

"Shipments of ore were made from the company's mines, as under:—

| | Tons. |
|---|---|
| Mother Lode | 410,688 |
| Wellington group | 9,935 |
| Lone Star and Washington | 2,101 |
| Napoleon | 17,118 |
| Queen Victoria | 1,080 |
| Total | 440.920 |

"**Mother Lode Mine.**—The transverse stope method of mining has been followed throughout the year, and has proved most successful in extracting the maximum quantity of ore at a minimum of cost. The tonnage shipped was the greatest for any one year in the history of the mine, and the cost of crushed ore, f.o.b, cars. at the mine has been the lowest, namely, 56.58 cents per ton. The drilling of new ground has been kept well ahead of requirements, there having been at the close of the year 5,000 holes, aggregating 65,000 lineal feet, in readiness for blasting.

"The ore reserves have not been materially increased during the year. The average grade of ore mined was below the normal grade of former years.

"The mining plant has been maintained in good condition, and the large quantity of ore has been extracted without serious accidents to either men or machinery.

**Wellington Camp Group.**—The ore that had been developed here was mined out during the seven months in the earlier part of the year, and in June the mine was closed for the time being. There is a large area of unprospected territory included within the company's holdings in this camp, but owing to extensive prospecting in other localities it was thought best to postpone further operations at the Wellington group until a later period.

"**Lone Star and Washington.**—This mine was operated in June, July and August only as, on account of the refractory nature of the ore, but little of it could be smelted directly. Working tests on large lots of the ore, using ordinary water concentration method, did not prove sufficiently successful to warrant the erection of a concentration plant. We are, however, making tests on other lines, which so far have proved satisfactory, and lead to the expectation that the problem of successful concentration and elimination of the refractory constituents of the ore will shortly be solved. The 300,000 tons of developed ore in this property, comprised within less than seven per cent. of its area, together with the comparatively high grade of the ore, make the ultimate solution of the problem of treatment a most important matter.

"**Napoleon.**—The 17,118 tons of sulphide flux shipped from the Napoleon mine during the year was of better grade, both as to gold and sulphur contains, than that for a number of earlier years. Mining and tramway costs were reduced to an average of $1.588 per ton of ore. The ore shipped was offset by new ore developed, leaving the ore reserves unchanged. These reserves are sufficient to serve all needs for many years to come. The machinery, plant and aerial tramway have been maintained in good condition.

"Through delays in receipt of machinery and by reason of further alterations found necessary at the Napoleon mill, it was late in September before all the problems relating to the treatment of the ore were finally and successfully solved. The quantity of ore milled was 6,483 tons. On account of the increased expense of mining and milling the oxide are in the winter season, when in the open quarry work it becomes mixed with snow and freezes into masses not readily handled, it was decided to close the mill until the spring of 1913, after which a steady and successful run should be had.

"**Queen Victoria.**—This property, which is situated nine miles west from Nelson, B.C., was purchased in November, 1912. The ore in it is an altered limestone similar in self-fluxing properties to the Boundary district ores, but it contains a higher percentage of copper. The mine is equipped with an electrically-driven compressor plant, and is connected with the Canadian Pacific Railway by an serial tramway.

"The months of November and December were occupied mainly in getting the mine into general working shape, and in opening new ground for stoping. In December, 1,080 tons of ore was shipped.

"**Smeltery.**—The smeltery at Greenwood was operated steadily throughout the year and smelted a larger quantity of ore than during any similar period in its history. During the first two and a half months, until a sufficient supply of coke was secured for the entire plant, only two furnaces were operated. The total quantity of ore smelted during the thirteen months of the fiscal year was 740,589 tons, as compared with a total of 608,945 tons for the twelve months of the fiscal year ended November 30, 1911. The sources of the material smelted were:

| | Tons. |
|---|---|
| From B.C. Copper Co.'s mines ...... | 443,022 |
| Custom ores ...................... | 284,575 |
| Converter slags .................. | 12,992 |
| Total ........................ | 740,589 |

"The quantity of coke consumed was 103,154 tons.

"The converter slags included:

| | |
|---|---|
| B.C. Copper Co.'s ores ............. | 914 |
| Custom ores ...................... | 4,104 |
| Clay ............................ | 1,205 |
| Total ........................ | 6,223 |

"There was produced 11,250,140 lbs. of blister copper, containing:

| | |
|---|---|
| Gold .................... | 25,862,681 oz. |
| Silver .................. | 142,025.06 oz. |
| Copper ................ | 11,0148,811.00 lbs. |

"No material additions were made to plant during the year, the machinery as a whole having been maintained in its normal condition.

"It is planned to use basic instead of acid lining for the converters, should this be found practicable without considerable additions to the plant. Through decreased cost for clay and elimination of labour in relining converters, it is probable that a decided reduction in the cost of converting can be effected.

"**Prospecting Operations.**—During the year twenty-three groups of mining claims in British Columbia or adjacent parts of the United States are examined by our engineers. This work resulted in the bonding of the Eureka group, near Nelson, B.C., and of a group of mineral claims on Copper mountain, near Princeton, B.C., known collectively as the Princess group. On these two properties exploration is being vigorously pushed by both handwork and diamond-drilling, with generally favourable results to date. Much exploration work was also done in Voigt's camp, on Copper mountain, with fairly successful results. The bond on the group in Voigt's camp was allowed to lapse, but negotiations are now in progress for renewal. Among the groups examined are three others of much promise; it is planned to explore these during the coming season.

"**Operating Costs.**—The yield i ncopper, gold, and silver for the past year was less per ton of ore than for any other year in the history of the smelting works; the costs per ton for ore-handling, etc., were lower than for any other year. On account of the low yield of metals, the cost of producing copper per pound was 12.85 cents, notwithstanding the very low handling costs.

"The following table gives a comparison of the principal items for the last five years:

| | 1908 | 1909. | 1910. | 1911 | 1912. |
|---|---|---|---|---|---|
| Yield of copper per ton of B.C. Copper Co.'s copper-bearing ores ................................ | 17.8 lb. | 17.7 lb. | 18.0 lb. | 16.4 lb. | 13.6 lb. |
| Yield of gold and silver per ton of B.C. Copper Co.'s Ores ...................................... | $0.985 | $1.03 | $1.23 | $1.133 | $0.762 |
| Average price realized for copper ................. | 0.13504 | 0.1308 | 0.12778 | 0.1233 | 0.16664 |
| Costs of producing, refining and marketing per pound of fine copper, after crediting expediture with value of gold and silver contents of ore .......... | 0.09996 | 0.09829 | 0.09048 | 0.11635 | 0.12855 |
| Costs of handling ore per ton, including all charges from ore in place to sale of the contained metals.. | 2.632 | 2.683 | 2.730 | 2.882 | 2.4596 |

"In concluding this report the writer wishes to bear testimony to the uniformly loyal support and excellent work of all those in charge of the various departments of the company, whose collective work has enabled the company to attain the results set forth in the statement of the auditors."

**Profit and Loss Account.**

"For thirteen months ended December 31, 1912:

| | | |
|---|---|---|
| "To operating disbursements— | | |
| Mining, smelting, freight, refining and selling charges, general office and administration expenses, maintenance of plant and equipment | $1,570,205.16 | |
| To custom ore purchased | 495,087.12 | |
| By proceeds of metal shipments, including those unsettled for at December 31, 1912 | | $2,483,663.96 |
| By miscellaneous earnings | | 7,613.72 |
| To balance carried down | 425,985.40 | |
| | $2,491,277.68 | $2,491,277.68 |
| By balance brought down | | $425,985.40 |
| By balance at November 30, 1911 | | 717,264.11 |
| To dividends Nos. 4 and 5 | $177,512.70 | |
| To balance carried to Balance Sheet | 965,736.81 | |
| | $1,143,249.51 | $1,143,249.51 |

**BALANCE SHEET AS AT DECEMBER 31, 1912.**

**Liabilities.**

| | | | |
|---|---|---|---|
| Capital Stock— | | | |
| Authorized $3,000,000 in 600,000 shares of $5 each. | | | |
| Issued | 596,709 shares of $5 each. | | |
| Less in Treasury | 5,000 shares of $5 each. | | |
| | 591,709 | | $2,958,545.00 |
| Sundry Creditors— | | | |
| Accounts payable, open and accrued | | $289,971.68 | |
| Accounts payable, covered by cheques in transit | | 46,938.73 | |
| | | | 336,910.41 |
| Reserve for employers' liability | | $5,365.32 | |
| Reserve for contingencies | | 5,000.00 | |
| Profit and loss account | | | 965,736.81 |
| | | | $4,271,557.54 |

**Assets.**

| | |
|---|---|
| Properties at cost, including smeltery site and plant, mines and mining equipment, and shares in other companies | $3,771,444.82 |
| Metals and smeltery products, supplies, etc., as per certified inventories | 193,054.96 |
| Copper on hand and in transit to refinery | 214,769.09 |
| Prepaid insurance and taxes | 4,763.37 |
| Accounts receivable | 3,923.64 |
| Cash on hand and in banks in New York and Greenwood | 83,601.66 |
| | $4,271,557.54 |

# THE OCCURRENCE OF PYRITES IN CANADA*

(Continued from April 15th issue.)

### NORTHERN ONTARIO OCCURRENCES.

**Northland Pyrites Mine.**—This property is located on the shore of James Lake, about three-quarters of a mile west of the Temiskaming and Northern Ontario Railway at the 83rd mile post. The discovery was made in 1903, but active development was not commenced until December, 1906.

The main shaft has a depth of 300 feet, with levels at 100, 175 and 275 feet. A winze was sunk from the second level, 75 feet north of the shaft, a depth of 100 feet, a drift running to the shaft, and then a raise was put up to connect with the shaft at the second level. Some of the ore north of the shaft has been removed by open cut workings, and a considerable amount of ore has also been stoped out on the second and third levels.

The main shaft on the deposit dips with the schist at an angle of about 70 degrees to the west. The lens-shaped ore body lies in a soft green schist about 100 feet east of the contact with a grey hornblende granite. The only impurity in the ore consists of small veinlets of quartz and massive pyrrhotite on each wall of the lenses. Occasionally, pyrrhotite is also finely disseminated through the pyrite. The ore breaks nicely, making very little fines in the course of mining

*See page 316 for General Map.

The ore is usually mined by underhand stoping. It is hoisted to the shaft house, where it is broken and cobbed. It is then dumped directly from the storage bin to the cars, a siding from the Temiskaming and Northern Ontario Railway having been built to pass under the ore bin. The greater part of the ore was shipped to Buffalo, N.Y.

The mine is equipped with two 100 h.p. boilers, a 12-drill air compressor, and a hoist.

The property is at present closed down.

In 1909, Mr. L. Hanna was manager. The head office of the operating company is at London, Ontario, and Mr. John Smallman is treasurer.

### WESTERN ONTARIO OCCURRENCES.

**Helen Iron Mine Pyrites Deposits.**—Located in the Michipicoten mining division, about 15 miles northeast of Michipicoten harbour, Lake Superior.

The Helen iron mine has been fully described in various reports of the Ontario Bureau of Mines.*. Underground working has revealed the existence of pyrites in large quantities. The pyrite and hematite deposits lie in a roughly elliptical rock-rimmed amphitheatre bounded on the east by a steep hill of iron carbonate, on the north by cherty carbonate and quartz porphyry schists, on the south by quartz-porphyry schist, and on the west by pyritous and cherty iron carbonates. The rock structures are almost vertical.

The Helen iron mine occupies the eastern end of a great pit-like depression. The ore body, as shown by the plans of the several levels, is elliptical in outline with an east and west axis about 500 feet in length, and a width of about 300 feet.

Lenses of pyrite occur throughout the hematite deposit, and the sulphide also occurs to the east, north and west of the hematite ore body. The pyrite consists almost entirely of granular ore. Lumps of hard ore are occasionally found, but the greater portion of the sulphide is in a fine granular condition resembling very clean concentrates. Occasionally, small veins of a clear, white quartz sand occur. Samples of ore will assay over 50 per cent. sulphur. Mine shipments will grade about 42 per cent. or better, dependent upon the amount of hematite that may become mixed with the ore.

The pyrite in the lenses or pockets, being closely confined by the hematite and of a saccharoidal structure, flows readily, like hot dry sand, wherever the pressure is relieved. Therefore, if an opening happens to be made in one of the lenses, it is necessary to take prompt measures to prevent the flow and to regulate it, if necessary. Special timbering is necessary, and even then the pressure is so great that opening into the pyrite can only be maintained with difficulty and for a short time.

Arrangements are being made to maintain a steady annual output of pyrites from this mine, which will probably be one of the largest pyrite producers in Ontario.

**Conmee Township.**—Thunder Bay district, Lot B, Concession V. Some work has been done on a deposit which lies on this lot about a quarter of a mile west of Bridge 31A, on the Canadian Northern Railway, some distance below Mokoman Station.

**Tip-Top Copper Mine.**—This property is situated 9 miles by trail southwest of the Canadian Northrn Railway at Kashaboiwe station. The main shaft is 200 feet deep, dipping 70 degrees to the north, and four levels, 50 feet apart, have been driven. The following is a synopsis of the work done in the various levels:

1st level. Drift to east. 80 feet in length.
1st level. Drift to west. 40 feet in length.
2nd level. Drift to east. 70 feet in length.
2nd level. Drift to west. 40 feet in length.
3rd level. Drift to east. 60 feet in length.
3rd level. Drift to west. 40 feet in length.
4th level. Drift to east. 65 feet in length.

Cross cuts:
1st level to the south. 60 feet in length.
1st level to the north. 140 feet in length.
4th level to the north. 130 feet in length.

Stopes:
1st level east. 40 feet long, 25 feet high, 8 feet wide.
1st level west. 30 feet long, 15 feet high, 10 feet wide.
2nd level east. 40 feet long, 10 feet high, 10 feet wide.
2nd level west. 30 feet long, 10 feet high, 8 feet wide.

Shaft No. 2, about 600 feet north of east from No. 1, is 50 feet deep.

Shaft No. 3, about 500 feet east from No. 2, is 20 feet deep.

The plant consists of 2 boilers one 70 h.p. return tubular, and one 30 h.p. marine; one hoist, cylinders 6 in. $\times$ 8 in., one Ingersoll-Sergeant 4-drill air compressor.

The associated rocks, according to Miller,† are a series of talc and green schists. Diabase occurs as a dyke rock and also felsite. The ore consists of copper pyrites, pyrrhotite and iron pyrites. It carries values in gold in addition to the copper.

The Tip-Top is essentially a copper prospect. Massive pyritic lenses in the mine would run upward of 40 per cent. sulphur, but there are extensive associated bodies of leaner and very highly siliceous ore.

**Steep Rock Lake Deposits.**—The depsits in the vicinity of this lake were very thoroughly prospected for iron ore. They lie north from Atikokan station on the Canadian Northern Railway.

Three-quarters of a mile west from the shore of the lake, the Mackenzie and Mann locations AL 461 and 462 have been prospected by four diamond drill holes. These are said t ohave disclosed a deposit of pyrites, but details are not available. The country rock on the surface is interbanded silica and highly altered green schist.

A very large deposit of iron pyrites has been uncovered at the southern extremity of Straw Hat lake. This is reached by a trail to the westward from the southern part of the eastern arm of Steep Rock lake. The work done comprises trenching, test pitting, and 4 diamond drill holes on locations 857 X and 858 X. The south trench shows a width of pyrite of over 140 feet, the eastern 60 feet of which would be quite high grade at shallow depth, as the only impurity was gossan. The ore showed unequal banding and nodular weathering. The astern portion of the ore shown in the trench is somewhat siliceous, and would not run more than 38 per cent.-40 per cent. sulphur. A test pit 100 yards to the north near the camps, shows very fair pyrites under a heavy capping of limonite and hematite. The hill, on which the south trench is located, is 30 feet high, and the whole gully to the west appears to be underlain with pyrite. Diamond drilling disclosed the

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*O. B. M. Reports for 1898, 1901, 1902, 1903, 1904, 1905.

†Ontario Bureau of Mines, 1903, p. 102.

pyrite in the form of a vast crescent, between the horns of which lies a deposit of hematite, an occurrence resembling very much that of the Helen iron mine.

The country rock to the west is an eruptive greenstone, and to the east it is a green chist. These, along the trail to Steep Rock lake, show at times a curious ellipsoidal weathering.

The deposits is 4 miles level draw from the Canadian Northern Railway to the southwest.

**Vermilion Pyrites Mine.**—This property, formerly the Vermilion Pyrites mine, and still earlier the Michie Pyrite mine, is now operated by the Northern Pyrites Company, 25 Broad Street, New York. The mining locations. H.W. 715 and H.W. 716, are situated on the shore of Big Vermilion lake, about 35 miles northeast of Dinorwic on the Canadian Pacific Railway, and about 4 miles from Graham on the Grand Trunk Pacific Railway.

The deposit lies in a depression between a rocky ridge which strikes somewhat north of east, and the shore of Big Vermilion lake. In runs into the lake towards the west end. The surface is covered by a heavy blanket of boulder clay varying from 8 feet to 20 feet in thickness. The only place where the gossan cap was exposed was on the shore of the lake where wave action had removed the clay cover. The lake derives its name from the discolouring of the water by iron oxide from this gossan cap, and the discovery was made by a prospector when searching for gold ores.

Two shafts have been sunk on the ore body. Number 1 shaft is vertical, 8 ft. x 10 ft. in section, and is used only as a manway and for pipe lines and ventilation. It is 260 feet in depth. This shaft is equipped with a standard 41 ft. Lidgerwood single drum hoisting engine. Number 2, the working shaft, is a 3-compartment shaft sunk in the foot wall at an angle of 58 degrees. The hoisting compartments are each 4 ft. x 6 ft., and the shaft is 260 feet in depth.

The aerial tramway, which was constructed two years ago to convey the crushed ore from the rock house to the spur from the G.T.P. Ry., about 3 miles distant, has been furnished with new equipment and a new terminal erected at the spur where the ore may be either direct to railway cars or stocked in piles for subsequent loading by means of a 10-ton locomotive crane alongside.

The mine has been equipped with new rock drills of both the piston and hammer styles as well as with new mine cars, air piping, tracks, etc. Overhead stopes have been opened preparatory to the resumption of shipments during the coming season.

A new office and warehouse, dry house for the underground men, powder magazine, machine shop, water lines, mess and bunk house, as well as several cottages have been provided.

About a year and a half ago, some 6,000 tons of ore were shipped, but since then there have been no shipments. The ore mined during development work was stock-piled. It is hoped that about 25,000 tons will be sent out this season (1911), if transportation facilities will permit; this will include ore mined in development work.

The ore body has been developed for 800 feet on the 2nd level. In addition, there is considerable drifting on the 1st and 3rd levels; the total amount of drifting in December, 1911, exclusive of cross cuts, was 1,500 feet. The width of the ore body varies from 30 to 63 feet.

According to Fraleck the interbanded pyrite and rock near the hanging wall side, as disclosed by the shaft and cross-cut is suggestive of vein filling, especially as some tourmaline was observed along the northern edge of the deposit. The laminated structure of the ore, however, renders it more probable that the deposit is of the replacement type, and that the banded pyrite and rock along the northern edge represent incomplete replacement of the schist. The country rock along the hanging wall side is composed of a greenish highly calciferous schist. The gangue matter of the ore is quartz. The ore body strikes northeast and southwest, and dips to the northwest at an angle of about 61 deg.

The ore consists of pyrites (with some pyrrhotite) which apparently runs about 40 per cent. sulphur; this also being the proportion of sulphur in the lost of ore already shipped. The ore is a hard and fine grained pyrite and will be mostly lump ore, with some fines. It has proved to be an excellent ore for acid making, the residual sulphur lost in the cinder being often less than one per cent., although this will be increased by any admixture of pyrrhotite.

The mine is operated for the Northern Pyrites Company, by Robert K. Painter, of Benson Mines, New York, as consulting engineer, and H. V. Smythe, local superintendent at the mine.

**Geological Relationships.**—In discussing the geological relationship of the pyrite occurrences in Ontario, Fraleck states that pyrite deposits have been found throughout an area of approximately 170,000 square miles, including eastern, northern and Western Ontario.

On the basis of their rock associates, he divides the deposits into three classes as follows:

1. The gneissoid, comprising the Brockville and Mattagami deposits. In both cases basic dykes are in close proximity.

2. Those of the iron formation, comprising the Helen, Straw Hat lake, and probably the Goudreau lake reposits; those in the cyrstalline limestone of Eastern Ontario are similar in origin, if not in age.

3. The remainder are associated with the crystalline schists with, in almost every instance, an eruptive greenstone close by.

## PYRITES IN BRITISH COLUMBIA.

The mineral pyrites is reported from many localities in this province. For the most part these occurrences are associated with gold or copper ores, and the deposits are not valuable because of the sulphur content of the ore. At the present time no pyrites is mined in British Columbia for its sulphur, nor, so far as the writer was able to learn, is any imported. The sulphides which are mined are smelted to recover copper and the precious metals, and the sulphur is burned off. It is possible that in the future, with the development of manufacturing industries, there may be a market for sulphur content of suitable ores. Present needs are satisfied by the importation of Japanese raw sulphur, which costs between $17-$18, per ton ton, in cargo lots at seaboard points.

There are two localities, at which pyrites deposits occur that are worthy of special mention, viz.: the Hidden Creek property of the Granby Consolidated Mining and Smelting Company, and an occurrence on the Ecstall River about thirty-five miles above Port Essington, owned by the British Columbia Pyrites Company.

**Hidden Creek.**—This property is located about three-quarters of a mile from tide water, on Goose Bay at the head of Observatory Inlet. It is now controlled by the Granby Consolidated Mining and Smelting Company, which owns 14 claims and has mining rights in several others. This company has been exploring and developing this prospect as a copper property for about two years, and it is probable that a smelter will be ererted in the near future.

A large body of sulphide ore has been developed by a system of tunnels and supplementary diamond drilling. A tonnage estimated at about 6,000,000 tons of 2 per cent. (copper) ore, or about 12,000,000 tons of 1.65 per cent. ore has been shown to be present. In addition, development work has shown a very considerable tonnage of ore of a higher grade—above 5 per cent.—and a large tonnage of low grade. A large force is now employed in preparing the property for operation on a large scale as a copper mine.

Much of the ore which occurs on this property is almost pure sulphides with high sulphur content, and a large tonnage occurs that is nearly pure pyrite.

Under present conditions there is no market for the sulphur content of the ore, and, as a consequence, the sulphur will be burned off and discharged into the air in the process of smelting. Should it be warranted by market conditions at any time before the deposit is exhausted, a large tonnage of pyrites with a low copper content will be available from this mine. As the mine is practically at tide water, it would be comparatively easy to deliver the ore very cheaply at any point on the coast. After treatment in a roasting furnace to recover the sulphur content, the cinder could easily be subjected to treatment to recover the copper and other values which it would contain.

**Ecstall River.**—This property is situated on Red Gulch Creek, a tributary of the Ecstall River, at the head of tide water, and about 35 miles above Red Essington. The portal of a prospecting tunnel, which is driven into the roe, is about 2,400 feet from the river. There is said to be an iron stained band on the west side of the creek, presumably pyrites, traceable for several thousand feet, and varying in width from 12 feet to 200 feet.

The writer visited the prospect tunnel on Red Gulch Creek, but was not able to visit the outcrop on account of the weather conditions. The sill of the tunnel portal stands only a few feet above the creek and the tunnel is driven into the side of the gulch. At about 50 feet from the entry it cuts an ore body of almost pure pyrite about 15 feet in width. Ore has been stoped out on each side of the tunnel for about 20 feet and the full width of the ore chute.

Outcroppings showing pyrite are said to occur in a number of other places further up the creek, and on the side of the valley. These were not visited. Exploratory work has been confined to the opening of this tunnel.

A sample shipment of ore from the tunnel, said to be about 100 tons, is reported to have been made to the Chemical Works at Victoria. The test of the trial shipment of ore showed that it is a very satisfactory ore for acid making.

Samples which were assayed show small values in gold, silver and copper. The sulphur content varies from 40 to 48 per cent.

Further exploratory work is required to definitely determine if the pyrites ore bodies on this property are large enough to be operated economically. At present there is no market on the coast for ore of this character and no work is being done on the ore bodies.

### PYRRHOTITE IN ONTARIO.

Pyrrhotites are not usually considered to be sulphur ores, since a pure pyrrhotite contains only 39.2 per cent. sulphur, which can only be recovered with difficulty, while pure pyrite assays 53.4 per cent. sulphur. Pyrrhotites have, however, been successfully roasted in several types of fines burners, without supplying additional heat from an external source; the gas produced contains a lower percentage of sulphur dioxide than that made from pyrites. Conditions might easily arise whereby it would be economical to employ ores of this kind for acid making.

Ores of this class have been found at a few localities in Eastern Ontario, but the most important known deposits are the nickel-copper-bearing pyrrhotites of the Sudbury district. Exploration work has shown that there are probably nearly 50,000,000 tons of this ore available in the district. Much of it will contain above 25 per cent. sulphur, some of it will run above 30 per cent. Present practice is to roast the ore in open heaps, driving off slightly more than one half the sulpsur. It does not appear to be commercially practicable to save this sulphur at the present time, i.e., the cost of recovering and marketing the sulphur would be greater than the value of the sulphur recovered. The expansion of the market for sulphur diovide and the introduction of improved processes may, in the future, so modify conditions that it may be practicable to recover and market some of the sulphur which is now valueless and is thrown away under present practice.

# HEDLEY GOLD MINING CO'S. REPORT FOR 1912

The annual report of the Hedley Gold Mining Co. (operating in British Columbia) for the year 1912, includes the reports of the President (Mr. I. L. Merrill), the General Superintendent, and the Treasurer, as follows:—

### Report of the President.

"During the past year things in general, at mines and mill, have gone along very well.

"We acquired the adjoining claims known as the 'Windfall Group,' lying to the northwest of our property. Our exploration work demonstrated that the ores pass into this acquired territory, which promises well for a lang life to our mines.

"For detailed information, I submit the reports of the Superintendent and the Treasurer."

### Report of the General Superintendent.

Mr. Gomer P. Jones, General Superintendent, reported as under:—

"For the year 1912 your mill has treated 70,455 tons of ore, having an average value of $11.19 per ton, or a total value of $788,715.05. The value of the gold won was $748,133.14—an extraction of 95 per cent. The profits were as shown in the Treasurer's statement.

"Owing to the increase in tonnage, which used practically all the power available, we have been able to do but little development work on the company's properties, excepting the Nickel Plate, where stoping and development work, in the orebody, has been carried on between the No. 3 and No. 4 tunnel levels, and the ore won has proven to be of a higher grade than estimated last year. The usual reserve tonnage of 10,000 tons of broken ore has been maintained.

"Mining below the No. 4 tunnel level has been very satisfactory and has proven that the orebody, as indicated last year by diamond drill, is a valuable addition to these reserves. An incline shaft (No. 5) has been sunk in the ore for 420 feet, three levels have been opened and a fourth commenced. Drifting and sinking proves this ore to be about 16 feet in width between walls and of an average value of $14 per ton. At the collar of the incline the length of the ore shoot is 130 feet; at the 100-foot level it has been drifted on for 180 feet, and on the third level for 80 feet. These drifts are in good ore all the way, and including the bottom of the incline all the faces are in ore. This incline is in good shape to ship from, with ore-pockets in each level and plenty of good ground for stoping.

"A section of the ground under the Nickel Plate orebeds has been proven by diamond drill; also a section of the company's property lying to the north; but owing to delayed negotiations for an option on the Windfall group of mining claims, adjoining the Iron Duke (one of the company's original claims), we did not commence drilling on this ground until July. By October seven holes were put down, and three of these showed good value. The last two holes were discontinued before they entered the ore zone, owing to the severe cold weather freezing the water in the long pipe-lines. These holes would, if completed, have aided us considerably in making an estimate of the reserve tonnage; however, we have no hesitation in stating that the minimum of reserve ore, as shown by development and diamond drill, available in the Nickel Plate and Iron Duke claims, is 413,000 tons, and that this ore will average at least $11.35 per ton.

"While the above-mentioned ground was being tested, and option was held for the purchase of the Windfall group, comprising five claims, namely, the Windfall, Morning, Winchester Fraction, Big Horn, and Czar, and on October 30, the purchase of these properties was consummated. The terms of the option did not allow time to prospect the ground, as it would have been necessary to drill each hole 500 feet at least before striking the ore-bearing sedimentary beds, but from indications in the hole drilled nearest the optional property and the high value in the remaining holes, we consider these claims valuable.

"To mine the new ore-bodies, as well as the other ore-bodies below the No. 4 level in the Nickel Plate mine, we have received instructions to sink and have started another incline shaft, to be known as the Dickson incline. The intention is to sink this to 3,000 feet in depth. It is located so as to be under all the known ore-bodies, and will have payable ore above it continuously. The probability is that it will be extended next year.

"The Sunnyside No. 4 incline has been extended 160 feet, and is in promising country. Development work in the Silver Plate showed some good ore, but it is apparently cut off by a large diorite dike. Both these properties are in a good formation, with favourable conditions.

"The cost per ton for mining and milling, for the year has been reduced 53 cents, and the total cost, 73 cents, although we have been paying a higher rate of wages, and the following additions, improvements, etc., have all been charged to operating expenses: Removing the old and installing the new boiler (150 h.p.), together with the cost of the boiler, new diamond drill, new hoist, improvements to the flume, general improvements to the mill, and all mine development.

"The mill has been kept in first-class repair and is doing good work; the water-flume is also in better shape than last year; and changes have been made on the tramway, so that its operation is more satisfactory.

"Altogether we believe the last year to have been most prosperous. We expect to see the ore reserves increased during 1913.

"Development was as follows: Nickel Plate mine: sinking 420 fet, drifting 510 feet; raising, 110 feet; Silver Plate mine, drifting 140 feet; Sunnyside mine No. 4, sinking 160 feet. Total development 1,340 feet. Diamond drilling, 6,380 feet."

**Report of the Treasurer.**

The report of the Treasurer, Mr. C. D. Fraser, follows:—

"Attached is Balance Sheet as at close of December 31, 1912, and detailed statement of earnings.

"The net profits for the year were $385,880. The dividends for the year aggregated $360,000, or 30 per cent. upon the issued capital stock. The undivided profits, after payment of all dividends, were $226,841.34 at the close of the year.

"New mining claims were acquired at a cost of $145,913.13, which outlay was capitalized. All other expenses of every kind during 1912 were charged to operating expenses; these included new 150 h.p. boiler, diamond drill, hoist, etc., as shown in the report of the General Superintendent.

"The low earnings for December were caused by extra heavy development work, which compelled the crushing of an unusual proportion of low-grade ore. In addition, much trouble was caused during that month by snow." (The January, 1913, earnings were normal.)

**Balance Sheet at End of 1912.**

—Assets.—

| | | |
|---|---|---|
| Mines, mine buildings, machinery, reduction plant, etc.: | | |
| Original investment | $ 920,000 00 | |
| Net expenditures for additions to plant | 127,294 08 | |
| Net expenditures for new mining claims | 145,913 13 | |
| | | $1,193,207 21 |
| Cash | | 233,634 13 |
| | | $1,426,841 34 |

—Liabilities.—

| | | |
|---|---|---|
| Capital Stock—Authorized issue. 150,000 shares at $10, par. | $1,500,000 00 | |
| Less $30,000 shares in Treasury | 300,000 00 | |
| | | $1,200,000 00 |
| Undivided profits January 1, 1912 | $ 200,931 34 | |
| Net profits for 1912 | 385,880 00 | |
| | $ 586,841 34 | |
| Less dividends paid in 1912 | 360,000 00 | |
| Undivided profits at close of year | | 226,841 34 |
| | | $1,426,841 34 |

**Operations and Earnings for 1912.**

| | Tons. milled. | Assay value. | Recovery at mill. | Expenditures. | Profits. |
|---|---|---|---|---|---|
| January | 5,701 | $10 70 | $56,298 64 | $29,669 72 | $26,628 92 |
| February | 5,010 | 9 49 | 45,513 84 | 27,431 75 | 18,082 09 |
| March | 6,263 | 11 60 | 70,077 84 | 30,712 89 | 39,364 94 |
| April | 5,326 | 10 55 | 54,683 93 | 29,427 82 | 25,256 31 |
| May | 5,636 | 10 64 | 57,778 52 | 26,711 00 | 31,067 52 |
| June | 6,027 | 10 13 | 58,200 96 | 28,042 22 | 30,158 74 |
| July | 6,110 | 9 97 | 58,750 33 | 27,801 91 | 30,948 42 |
| August | 5,900 | 12 11 | 66,720 19 | 28,627 97 | 38,092 22 |
| September | 6,108 | 16 38 | 96,055 85 | 31,054 73 | 65,001 12 |
| October | 6,101 | 11 69 | 66,637 58 | 28,399 49 | 38,238 10 |
| November | 6,003 | 11 57 | 64,487 36 | 35,654 20 | 28,833 16 |
| December | 6,270 | 9 07 | 52,928 10 | 38,719 65 | 14,208 45 |
| Totals | 70,455 | $11 19 | $748,133 14 | $362,253 14 | *$385,880 00 |

*Including $9,834.69 interest earned on funds of the company during 1912.

# PERSONAL AND GENERAL

Mr. A. W. Allen, secretary of the Lucky Jim Zinc Mines, Ltd., proceeded from Victoria, B.C., to Kalso, Kootenay Lake, at the end of April, to attend the annual meeting of the company called for May 1 at the latter place.

Mr. Melbourne Bailey, for years actively engaged in placer-gold mining on a large scale in Cariboo, British Columbia, has arranged to return to that district for the ensuing hydraulicking season, after having spent the winter at his home in Tacoma, Washington.

Mr. T. Walter Beam, of Denver, Colorado, has bonded a number of mineral claims situated in Hedley camp, Similkameen, B.C., and has arranged to extensively prospect the ground with diamond-drills. The exploration work will be done under the immediate supervision of Mr. Gomer P. Jones, of Hedley, general superintendent for the Hedley Gold Mining Co.

Mr. E. V. Buckley, manager of the Queen gold mine, in Sheep Creek camp, Nelson Mining division, British Columbia, has informed the Nelson Daily News that sufficient miners have returned to work at the Queen mine to admit of operations being resumed at the Queen stamp mill. The men are reported to have stated that they were induced to strike by representations that have not since been found correct, so they have returned to work at the old rate of wages.

Mr. W. A. Cameron, superintendent of the Consolidated and Mining and Smelting Co's Richmond-Eureka mine, has returned to Sandon, Slocan, from a trip to the British Columbia coast, and, now that the danger from snowslides has past, has resumed work at that mine.

Mr. M. S. Davys, managing director for the Silverton Mines, Ltd., and Mr. G. Stilwell, the company's superintendent, have succeeded in overcoming the obstacles that since the destruction of the lower terminal of the aerial tramway and the Wakefield mill by fire last June had prevented a continuence of ore production. The new concentration plant, which includes provision for the Minerals Separation flotation process, is now being operated.

Mr. W. J. Elmendorf, of Victoria, B.C., manager for the Portland Canal Tunnels, Ltd., has made a progress report to the directors of the company on the work of driving a 2,200 ft. cross-cut adit the company undertook and which was commenced last September. By April 1, ultimo, the face of the tunnel was 823 ft. from the portal, and it was estimated that the 1,000 ft. mark would be passed by May 1. This exploratory work is the most important yet undertaken in Portland Canal mining division, for it will prove ground to a depth of 2,200 ft. below the level of the workings of the Portland Canal Mining Co., from which about 8,000 tons of ore has been mined.

Mr. Jay P. Graves, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Co., Ltd., has returned to his headquarters in Spokane, Washington, after having spent the winter in southern California.

Mr. S. W. Hall, of Butte, Montana, who is superintending the development of a part of the holdings in that camp of the Butte-Duluth company, which has come into some prominence lately in connection with the claim that nearly pure metallic copper is being produced by a leaching and electrolytic refining process in use by that company and the Bullwhacker, operating in the same district, was formerly managing mines at Rossland, B.C. He is a son of the late Mr. W. E. Hall, at one time manager of the Le Roi mine, Rossland, who came to his death in January, 1898, by falling down one of the shafts of the mine.

Mr. J. M. Harris, of Sandon, Slocan, B.C., well known as one of the principles in the long-drawn-out litigation between the Star and Byron White companies, involving extra-lateral rights, has lately been visiting the Panama canal.

Mr. R. A. A. Johnston, mineralogist of the Geological Survey of Canada, who has been on, a vacation spent a few days in Victoria, B.C., in the course of his holiday wanderings.

Mr. Oscar Lachmund, general manager for the British Columbia Copper Co., last month visited Princess and Voigt's camps, Copper Mountain, Similkameen, B.C. He was accompanied by Mr. Frederic Keffer, the company's engineer and geologist.

Mr. Douglas C. Livingstone (B.Sc.,McGill, 1906), associate professor of mining engineering at the University of Idaho, Moscow, Idaho, has been examining the Center Star property, Elk City, Idaho, which is under bond to Pittsburgh, Pa., capitalists.

Mr. T. J. Lloyd, underground superintendent at the Van-Roi mine, Slocan, has given the Consolidated Mining and smelting Co., a bond on a group of mineral claims situated near Four-mile Creek, Slocan lake district, B.C.

Mr. C. H. McDougall (B.S.c., McGill, 1905), superintendent of the Consolidated Mining and Smelting Co's St. Eugene and Sullivan Group mines in East Kootenay, was lately convalescent after having been ill in the Kootenay Lake hospital at Nelson.

Mr. Alfred McMillan has returned to Northport, Washington, from a stay at the Halcyon Hot Springs, Arrow Lake, B.C. He is in charge of the smelting works at Northport, and other property of the Le Roi Mining Co., in liquidation.

Mr. I. M. Merrill, president of the Hedley Gold Mining Co., recently paid a visit to that company's mine and stamp mill in Hedley camp, Similkameen, B.C.

Mr. W. H. Nichols, of New York, president of the Granby Consolidated M.S. and P.C., has gone to Europe on a two months' vacation.

Mr. Fred S. Peters, superintendent of the Le Roi mine, Rossland, B.C. has been in the hospital in that city for treatment during illness.

Mr. M. E. Purcell, superintendent of the Centre Star-War Eagle group of mines, in Rossland camp, is making arrangements for the reception there of visitors who will attend the Fifteenth General Meeting of the Western Branch of the Canadian Mining Institute, to be opened in Rossland on the evening of May 22. As the meeting will be a joint meeting with the Spokane Local Section of the American Institute of Mining Engineers, it is expected the attendance will include a number of visitors from the State of Washington and several from Idaho, as well as others from the Kootenay and boundry districts of British Columbia. The provisional programme is May 22, evening meeting; May 23, visit to local mines in daytime, and evening meeting; May 24, visit to Consolidated and M. and S. Co's smeltery and refinery, at Trail, and amusement evening.

Mr. E. C. Semmens, who has had a lengthy gold mill experience in Western Australia and West Africa, has been apointed to charge of the 10-stamp mill, on Cadwallader creek, Lillooet district, British Columbia, of the Coronation Gold Mines, Ltd. The company two years ago aquired the Ben d'Or gold mine and mill and other mining property in the vicinity, and since then has done much underground development with promising results, so with sufficient ore developed for stoping the mill is to be operated this season.

Mr. R. J. Spry, is superintendent of the Eureka mine, near Nelson, B.C., which property is being developed by the British Columbia Copper Co., under option of purchase.

Mr. Thos. R. Stokett is being heartily congratulated on the satisfactory results achieved at the New Reserve Shaft Mine, near Nanaimo, Vancouver Island, which mine is being opened under his direction (see Canadian Mining Journal for Apiil 1, p. 212). Coal has been entered at a depth of 1046 ft., and the seam is reported to be 10 ft. in width of coal of excellent quality.

Mr W. J. Sutton, of Victoria, B.C., has been nominated as chairman of the Western Branch of the Canadian Mining Institute for the ensuing year, to May, 1914. It would be particularly appropriate for the branch to have its chairman at the time of the visit to British Columbia of excursion parties of the International Geological Congress, a geologist so well known in the province as is Mr. Sutton, so his election by acclamation may be expected.

Mr. E. E. Ward, of Ainsworth, B.C., superintendent of the Silver Hoard mine, had an unpleasant experience recently. He was going up from Kootenay lake in one of the buckets on the No. 1 mine aerial tramway when something went wrong and the cable stopped running. Hung up during a snowstrom, he was in a predicament until a miner climbed one of the towers and threw him a rope, by means of which he lowered himself to the ground.

Mr. W. P. White, of Spokane, who, some years ago, was superintendent of the St. Eugene lead mine in East Kootenay, during its period of greatest production, was lately in Boundary district of British Columbia.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was in Toronto last month attending the annual general meeting of the company.

Prof. Chas. E. Van Barneveld, recently appointed chief of the Mining Department of the Panama-Pacific Exposition, is Professor of Mining Engineering at the University of Minnesota, Minneapolis, Minn. He is a McGill University graduate (B.A.Sc.,1895). The Engineering and Mining Journal says: Professor Van Barneveld is the Dean of the School of Mines of the University of Minnesota. He is preparing to take up the exposition work immediately. He held a position in the University of Minnesota for fourteen years, and during that period travelled extensively in behalf of the University. For six years prior to that period he was engaged in practical mining, in the south-western States and in Mexico. He is the author of "Iron Mining in Minnesota." He was formerly a resident of California and is a land-owner in the Sacramento and San Joaquin valley. The mining building to be erected at the exposition will occupy an area of 350,000 square feet. It is proposed to make the exhibit greater than that of any previous exposition.

# PLATINUM IN BRITISH COLUMBIA

The following is an excerpt from the chapter on "Platinum and Allied Metals," by Mr. Waldemar Lindgren, in the United States Geological Survey's valuable report, entitled "Mineral Resources of the United States, 1911." (Part I. pp. 1000-1001.)

"British Columbia.—The presence of platinum metals in British Columbia has been known since 1887. The upper branches of Similkameen river are known to contain platinum, especially the North Fork, usually referred to as the Tulameen river. A considerable black production was at one time maintained from these gold and platinum-bearing deposits. (See Camsell, Chas.; Platinum Mining in the Tulameen District; Jonrual Canadian Mining Institute, Vol. XIII., 1910.) Camsell estimates the total production of crude platinum from this district at 9880 ounces. The richest platinum ground was found on Tulameen river between the mouths of Slate and Champion creeks. On Tulameen river no platinum was found above the mouth of Champion creek, and below Slate creek the grains became finer and the quantity gradually decreased. The platinum in some cases was present in a ratio of 1 to 3 by weight, as compared to gold. During 1911, active prospecting has been carried on, and it is stated that workable ground has been discovered. Dredging is the process which it is intended to apply to the deposit. During the last few years the annual production of platinum from some of these placers has amounted to only a few ounces. Statements in the press are to the effect that the depth of bedrock averages 12 feet. A company organized in Vancouver has leased some 20 miles of Similkameen and Tulameen rivers from the Government. The production for 1911 is estimated at 30 ounces. Much of the gold and platinum in this district is coarse and the nuggets have not travelled far from the original source. Much of the gold is still embedded in quartz, while the platinum is often associated with chromite, olivine and pyroxene. Kemp mentions platinum intergrown with olivine and octahedral chromite from the district. One of these specimens shows the contemporaneous development of the three minerals very clearly. The rock from which the platinum was derived is probably a belt of basic intrusives, mainly peridotite, having a flanking border of pyroxenit. Kemp concluded that the original sources of the platinum was in both the peridotite and the pyroxenite, and this conclusion is corroborated by Camsell. The heavy minerals associated with platinum, beside those mentioned, are magnetite and native copper. An analysis of the crude platinum gave, according to G. C. Hoffman, quoted by Camsell, the following results:—

| | |
|---|---|
| Platinum | 72.07 |
| Palladium | 0.19 |
| Rhodium | 2.57 |
| Iridium | 1.14 |
| Osmium | .... |
| Copper | 3.39 |
| Iron | 8.59 |
| Osmiridium | 10.51 |
| Gangue | 1.69 |
| | 100.15 |

"Kemp assayed a number of specimens of platinum-bearing rocks, such as serpentine, chromite, pyroxenite, and peridotite, from this district and found in most of them traces of platinum. Some of the selected chromite gave half on ounce of platinum per ton. Other samples contained from 0.1 to 0.3 per cent.. of the metal. It is exceedingly improbable, however, that valuable deposits of platinum will be found in the parent rock.

"Reports were current during 1911 of a discovery of platinum metals at and near the Granite-Poorman mining property, a few miles from Nelson. A well-defined dike bearing these metals is said to have been traced for several miles in the general direction of Forty-Nine-mile creek and Kootenay river. A statement is made by E. Jacobs in the Canadian Mining Journal of September 1, 1911, that the rock containing the platinum metals is serpentine and probably an altered peridotite. The predominent metal is said to be palladium, though platinum and other allied metals are also said to occur. Whether the find is of economic importance is not certain. The existence of a new metal named canadium has been reported in this serpentine rock, but the discovery has not been confirmed."

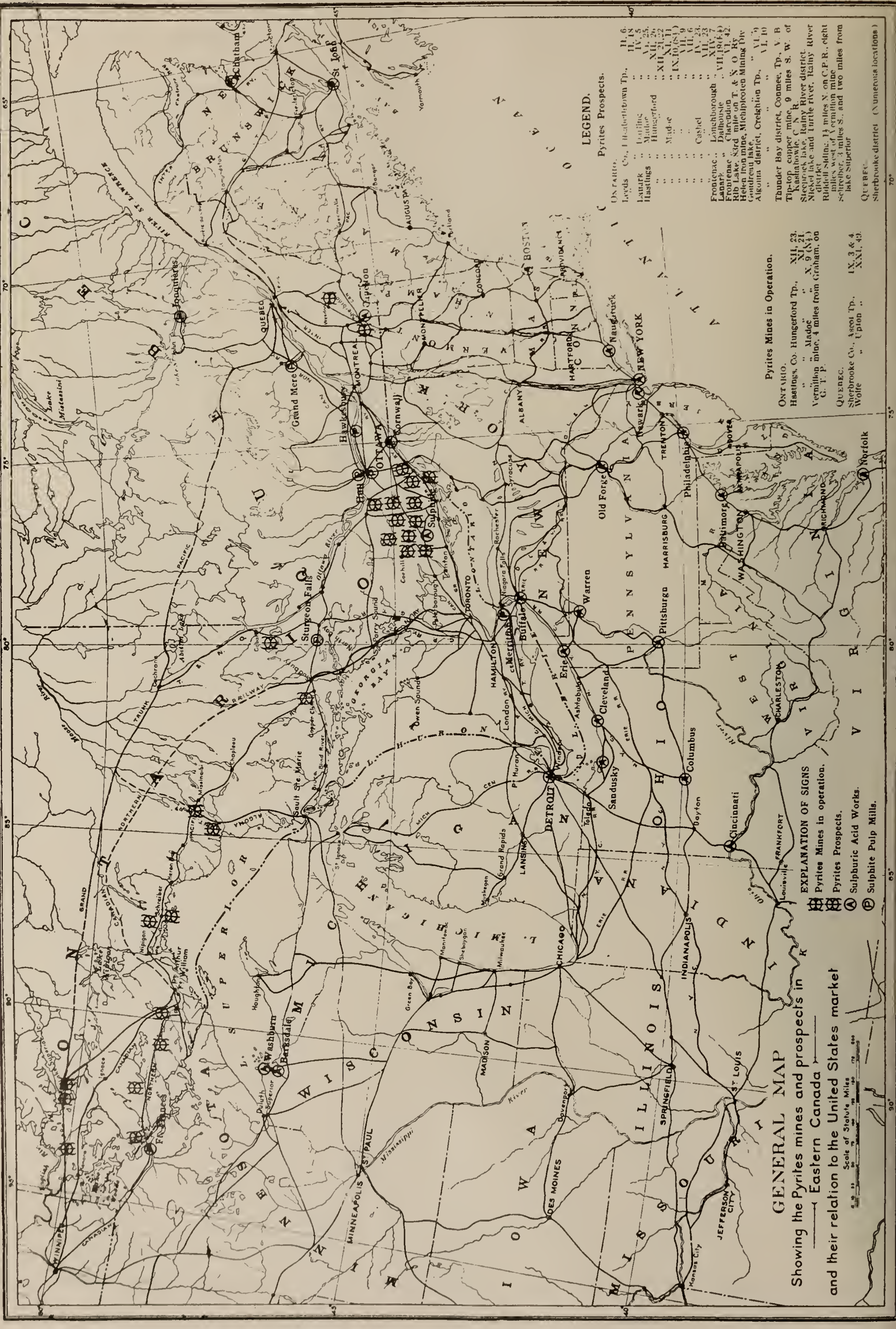
In his observations in the "Determination of the Platinum Metals," Mr. Lindgren includes the following:—

"The correct determination of platinum metals is somewhat difficult, and mistakes are often made by inexperienced chemists and assayers. It is difficult to say how much of the mistakes found in reports of new discoveries of platinum in the current press is due to such inexperience and how much to deliberate fraud. The most ridiculous statements are often made. A statement was made, for instance, in 1911, of a discovery of an 'immense bed of Osmium near Boise, Idaho.' The analysis was given as follows:—

| | |
|---|---|
| | Oz. per ton. |
| Gold | 2.3 |
| Iridium | 0.1 |
| Osmium | 20.0 |
| | Per cent. |
| Tungsten oxide | 5.0 |
| Tin | 0.25 |
| Cobalt | 0.5 |
| Nickel | 1.0 |

"Other statements were current of a discovery near Merlin, Oregon, of a rock containing tin and platinum. It was claimed to contain from 1 to 65 ounces of platinum per ton, and said to occur 'in a mineralized zone 600 feet wide, with 15 feet of spherulitic gangue and 8 feet of pitch-blende.' It is unfortunate that such statements should find even temporary credence."

(Note.—The statement attributed b yMr. Lindgren to Mr. E. Jacobs was contained in a quotation made by the latter, as follows: "E. R. Widdowson informed the Nelson Daily News that 'palladium is the predominating metal of the platinum group discovered near Nelson by Mr. A. Gordon French. It is obtained from a serpentine dike, which is probably an alteration of a peridotite dike. The dike material varies in colour from a dark green to a dark yellow, and is so soft that it can be mined with a pick. The metal is a hard, silvery white substance, but is not visible in any of the ore I have assayed. In all I have made some 50 or 60 determinations for palladium, and the other rare metals, for my various clients, and I am well able to confirm the presence of the metals discovered by Mr. French.' ")


GENERAL MAP
Showing the Pyrites mines and prospects in Eastern Canada
and their relation to the United States market
Scale of Statute Miles
EXPLANATION OF SIGNS
Pyrites Mines in operation.
Pyrites Prospects.
Sulphuric Acid Works.
Sulphite Pulp Mills.
LEGEND.
Pyrites Prospects.
Thunder Bay district, Coomee, Tp.
Sherbrooke district (Numerous locations)
Pyrites Mines in Operation.
ONTARIO.
Hastings, Co. Hungerford Tp., XII, 23.
QUEBEC.
Sherbrooke Co., Ascot Tp. IX, 3 & 4
Wolfe " Upton " XXI, 49.
NEW YORK
Philadelphia
Norfolk
Cleveland
DETROIT
CHICAGO
Pittsburgh
MONTREAL
OTTAWA
TORONTO
QUEBEC
St John
Sault Ste Marie
Sudbury
Port Arthur
Fort William
Washburn
Barksdale
Cincinnati
Columbus
Sandusky
Buffalo
ST PAUL
MINNEAPOLIS
DES MOINES
St Louis
SPRINGFIELD
INDIANAPOLIS
Louisville
FRANKFORT
CHARLESTON
WINNIPEG

# THE TRANSMISSION OF POWER BY COTTON ROPES

*By E. EDWARD HART, M.A.*

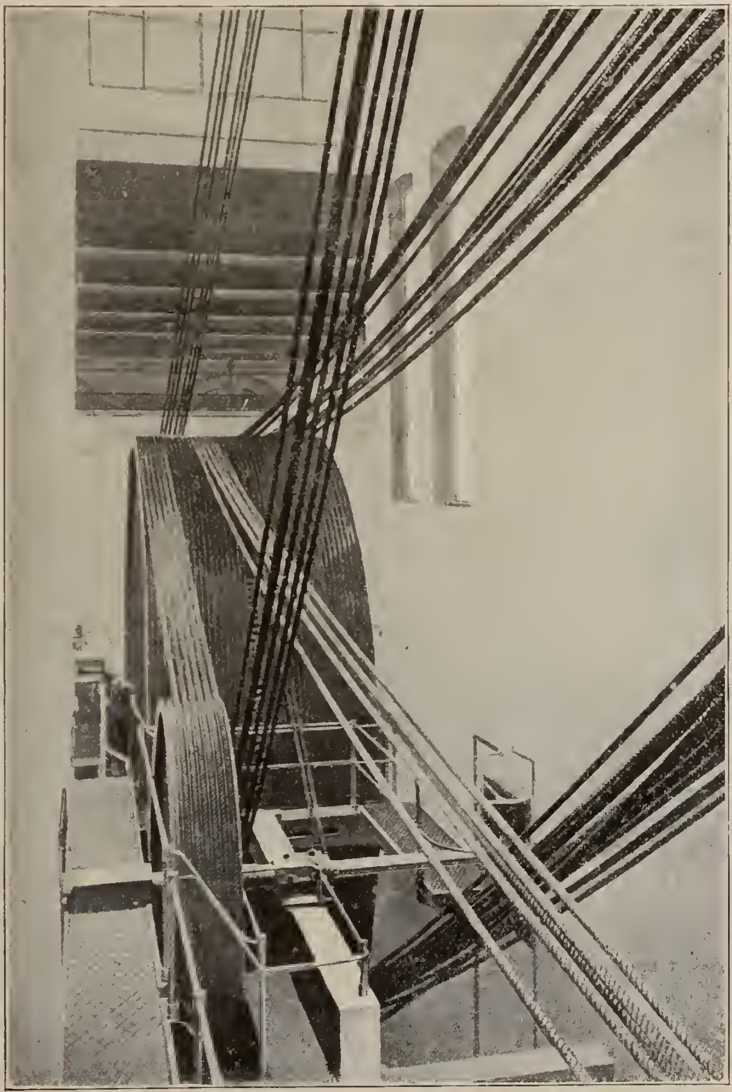
A Paper Read Before the Association of Engineers-in-Charge

The method of transmitting power from one pulley to another by means of ropes is generally termed rope driving. The rims of the pulleys are specially grooved to receive the ropes, and the power is transmitted by means of the frictional resistance between the rope and the pulley groove.

There are two systems in use: (1) The American or continuous system, where one long rope is wound continuously around both driving and driven pulleys, the last wrap being carried across the width of the pulleys back to the first groove by a carrier pulley set at the required angle. This is extensively used in America, but rarely found elsewhere; (2) the English or separate rope system, where each rope on the driving pulley runs straight and true into its corresponding opposite groove on the driven pulley. This is by far the commonest practice, and is the one to which I shall confine my attention.

For main drives, both three and four-strand ropes are used, and usually vary from 1-in. to 2-in. in diameter; but on small fans and fast-running textile machinery, smaller bands and ropes, between $\frac{1}{4}$-in. and 1-in. diameter, are more suitable. The rope-speeds most frequently employed are from 2,000 to 5,000 feet per minute.

The earliest ropes used for power transmission were probably of leather or hemp, and though there are one or two instances of main drives on record in the early years of the nineteenth century, it was not until about 1860 that Messrs. James Combe & Co., of Belfast, introduced rope driving for large powers. From Ireland the system spread to Scotland, and in a short time it was well known and used by the manufacturers of Lancashire and Yorkshire. Leather ropes were soon discarded owing to their expense and the difficulty of their manufacture and hemp ropes took their place. This was probably due to the fact that hemp was easily

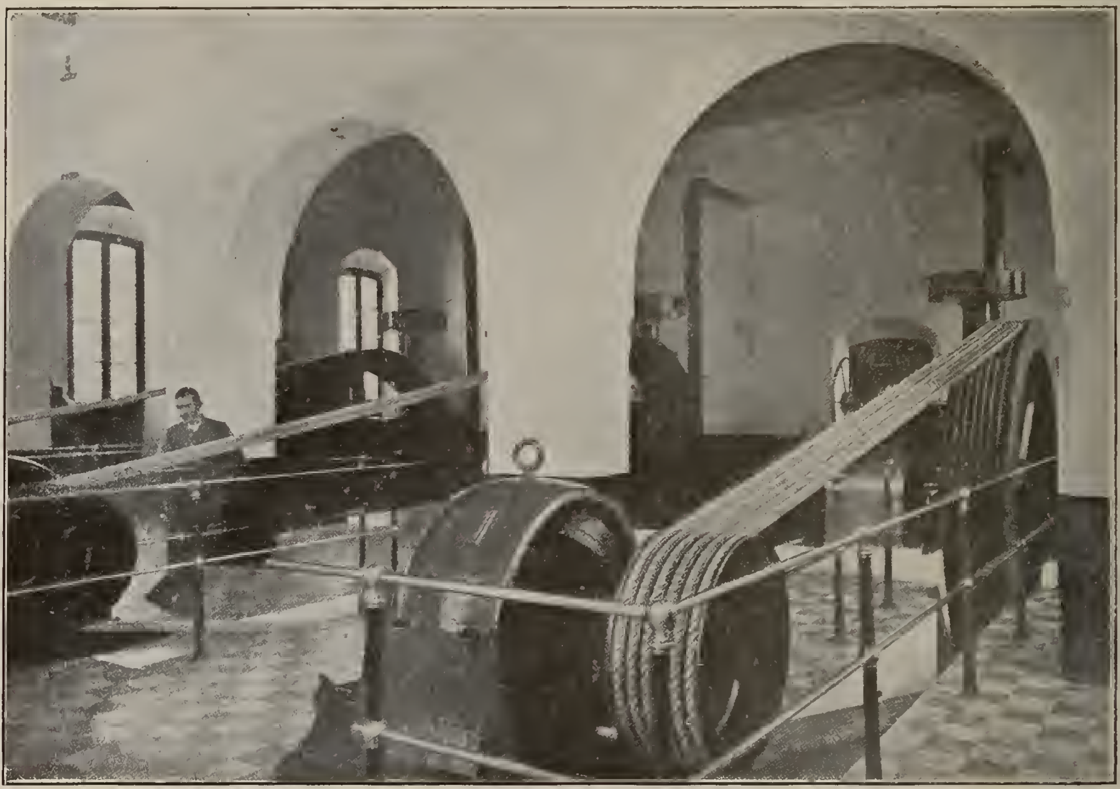


**Rope-race in a Modern Mill.**

obtainable in Belfast and Dundee, being largely cultivated in those districts.

Although several hemp driven ropes are running today, owing to the harsh nature of their fibre it was soon discovered that for power transmission, ropes made from cotton gave far better results. It is probable that from the very first cotton bandings or small plain laid ropes were used for driving the cotton-spinning frames in the Lancashire mills. Certain it is that my grandfather, who died in 1861, had been making them for many years. But the idea of driving a whole mill with ropes by having the engine flywheel grooved for their reception does not seem to have been adopted in Lancashire and Yorkshire until about five or ten years after this date. Even then ropes like the ones used in Belfast and Dundee were used at first, as they were purchased, probably, along with the engine. In the heart of the cotton-spinning district the change from hemp

The stopping of a mill owing to broken gearings is now practically unknown, and it is only necessary for one to have had the experience of working in close proximity to a large geared engine to appreciate the absolute noiselessness of a well-designed rope drive, and its freedom from vibration. As regards first cost and maintenance, a rope installation is very much cheaper than leather belts, or shafting and gearing, and where space is a consideration, it is often possible to put up a successful rope drive where there is literally no room for any other system. Electrical engineers have found it very useful in adjusting velocity ratios of shaftings, as, by using rope drives they are enabled to use higher speed, and consequently lower-priced motors. Besides this, ropes will transmit a large temporary overload without slipping, and it is possible to greatly reduce capital charges by driving a series of machines, or lines of shafting, from one motor.



**Three Sets of "Lambeth" Ropes Driving Dynamos from Gas Engines at a Mine in Spain.**

to cotton was not long in coming. And when once cotton ropes had been properly tried, their marked superiority was at once so apparent that they almost immediately displaced hemp ropes for power transmission. And to-day, with one or two notable exceptions, cotton ropes have entirely superseded hemp ropes for transmitting power in every part of the world where rope drives are to be found. And though they were only used at first in textile factories, the superior pliability of the cotton fibre has led to its adoption in mills and works of every description.

As years went on, the advantages of the system were more and more recognized. In connection with steam engines, gas engines, oil engines, and water and steam turbines, it was found that large mills several storeys in height could be easily driven from one prime mover, and that power might be transmitted to shafts over 100 feet away, without the use of long lines of heavy and expensive shafting or gearing.

The resilience of ropes, too, is found to considerably reduce the wear and tear of machinery, and they are being more and more used in steel rolling mills, cement works, and rubber factories, where sudden and severe overloads are constantly being met with. Another advantage is that, with the English or separate rope system, should a rope show signs of wear, it can be removed during the dinner hour without causing a stoppage of the mill, and can be respliced at any convenient opportunity, say the end of the week, without any excessive strain being put on the rest of the ropes. Rope gearing is also more positive in its transmission than belting, and consequently no allowance need be made for slip.

### The Loss of Power in Rope Transmission.

Several experiments have been made from time to time to ascertain the loss of power in driving with belts and ropes, and to compare their efficiencies.

(To be continued.)

# SPECIAL CORRESPONDENCE

## ONTARIO

### PORCUPINE, SWASTIKA AND KIRKLAND LAKE.

Owing to the giving away of the flume at the Sandy Falls plant of the Northern Ontario Light & Power Company, as a consequence of the tremendous floods north of the height of land, the power situation in the camp is more serious. There is for the time being no electrical power in the camp. Most of the companies, however, have their own steam plants, and they will revert to them until the break has been repaired. The operations have outgrown these plants in many instances and production or development will have to be curtailed, but in only rare instances has the failure of electrical power caused a complete shut down. The Hollinger has reverted to their steam plant, which, fortunately, has been considerably augmented since Sandy Falls enabled them to run with the electric current. Progress is being made with the repairs at the Waiwaiten Falls, and the plants obtaining power from this source should soon be able to hook up again.

The floods which have distressed the whole of the country sloping towards Hudson's Bay are phenomenal, and there is no cause to look for a repetition of these disasters.

An organization, unimportant in its inception, but of significance, is the Northern Prospectors' Association, which has been formed at Porcupine. This is purely local at present, but may spread all over the field. It is formed for the ostensible purpose of promoting the interests of prospectors, particularly in relation to legislation. It is an organization which certainly has no forerunner in Ontario.

In the first month's run at the McEaeney mine the mill heads ran $30 to the ton. The mill at this time was treating on an average of fifty tons per day.

The outstanding feature of the Kirkland Lake camp is the fact that one company has shipped $32,737.44 in gold from an open cut and a shaft 115 feet deep. As there was but 73.85 tons of it, it works out at approximately $448 to the ton. This is a conservative estimate, as the gold is reckoned at $20 to the ton only. It is also remarkable that the silver contents pay for freight and treatment and leave only haulage to Swastika station and mining to be deducted. The figures are so remarkable that they are given in full:

| Tons. | Gold ozs. per ton. | Gold contents. | Value at $20 per-oz. |
|---|---|---|---|
| 1.85 | $18.60 | $34.41 | $688.20 |
| 19.90 | 22.50 | 447.75 | 8,855.00 |
| 21.60 | 19.75 | 422.72 | 8,454.24 |
| 30.50 | 24.00 | 732.00 | 14,640.00 |
| 73.85 | | 1,636.87 | $32,737.44 |

**Silver Contents.**

| Tons. | Silver. per ton. | Silver per oz. | Silver at 60c. an oz. |
|---|---|---|---|
| 1.85 | 22.70 | 41.99 | $24.19 |
| 19.90 | 23.40 | 465.66 | 279.39 |
| 21.60 | 33.56 | 724.89 | 434.93 |
| 30.50 | 35.00 | 1,067.60 | 640.20 |
| 73.85 | | 2,300.04 | $1,378.78 |

The first shipment of 1.85 tons was a sample lot from the outcrop of five veins including No. 2, or the main vein, which furnished all the remainder of the shipments to date. All of the above ore with the exception of the last shipment came from an open cut on the No. 2 vein. This open cut had an average width of 32 feet and it was put down 24 feet before the incline shaft was commenced. The last shipment was made from the incline shaft, put down to a depth of 115 feet on the vein. The shaft has made 125 dollars per foot net profit. The main high grade vein which alone has been shipped will average from ten to twelve inches in width. The management claims that the milling ore on the foot wall and hanging wall has a total width of twenty feet and will run $20 per ton.

The No. 2 vein from which all the ore has been taken has been stripped for 390 feet till it dips under a heavy overburden at the east end.

The high grade streak is not more than two or three inches wide on the surface and was so little impressive that most of the consulting engineers of the big companies turned it down even at the small price that was asked for it a year ago. Where the vein has been mined is entirely in coarse conglomerate, but it appears to fuse with the gray porphyry at the east end. The first ore was mined on Nov. 18th. There are several other promising veins on the property, No. 3 has been stripped for 700 feet and promises to make a good body of milling ore. It is entirely in the porphyry.

The first unit of the mill should be running by the middle of the month, and there are 2,000 tons of milling ore out of development already broken. This little plant will handle at least fifteen tons per day.

Since the first of December 900 claims have been staked and filed near Swastika. Apart from the Foster no real mining has been attempted. Two shafts have been put down to the fifty-foot level, but that is all. The camp is quite in the making, but it may be said that so far as development has proceeded it has yielded quite satisfactory results. Another point in the favour of capital here is that the prospector is sweet reasonableness itself in comparison with his attitude either in Porcupine or Cobalt, Gowganda or Elk Lake. The Foster was secured on a working option for a few thousand dollars, and though prices have necessarily advanced since then they are comparatively modest. The Hughes Teck has a shaft down to the fifty-foot level and it is said that it has stood up well under careful sampling. Harry Oakes, one of the pioneers of the camp, also has some promising claims and good finds have been made on the Orr, now the Wettlaufer properties, the Hunton and some others.

The six miles long wagon road from Swastika to Gull Lake which promises to be the centre of operations is not in good shape just now, but can easily be made reasonable with the expenditure of a little money. The Government with commendable promtitude has made a grant of $10,000 for the road and Mr. Whitson already is making his plans.

At Swastika, the Lucky Cross mill is now running and is said to be making a satisfactory recovery. The cutting of the No. 16 vein at the 200-foot level has greatly improved the prospects of this mine. At one spot where a blind vein makes junction there is ten feet of milling ore and the vein has a normal width of three feet of ore that is decidedly of better grade than at the upper level.

Stamps are also dropping at the Swastika mill, and the first clean up of approximately $3,000 has been made as the result of 26 days' run.

Most of the members of the Lucky Scott party that adventured to Labrador last year are going to the east coast of Hudson's Bay.

Sam Itisse, of the Otisse mine, Elk Lake, is heading the first party towards placer fields. They have gone to Cochrane, whence they will strike with six months' provisions up to the Bell to Ruperts House and then probably to the East Main. Two other parties will also be equipped this year for much the same journey, one from Ottawa and one from Toronto.

The Gold Fields, Limited, at Larder Lake, is very materially raising the capacity of its plant by adding four tube mills and a cyanide plant. The mill is now treating about 75 tons per day of low grade ore. The d'Or Huronian mine, about eight miles from them are putting in a plant to work an ore body with a promising outcrop. The Dane Mining Company, about eight miles from Dane Station, is also busy again so that the whole section is quite active.

**COBALT, GOWGANDA AND SOUTH LORRAIN.**

Permission to drain Kerr Lake and keep it drained for seven years was given in Toronto to the Kerr Lake and Crown Reserve Mining Companies by Mining Commissioner T. E. Godson. The terms of the order are to be fixed after the notice to the other mines has been served. This is the first application of its kind made to the Mining Commissioner under his increased powers granted under the Mining Act. At the hearing the Penn Canadian mines, the Bailey-Cobalt and the Kerr Lake Maestic Mining Company were the only companies represented from among those continguous to the lake. It is expected that the work of pumping out and draining Kerr Lake will be commenced about July 15th by the two mining companies.

If the Cobalt Lake Mining Company obtains consent to pump out Cobalt Lake the company promises through its Cobalt manager to spend thousands of dollars to make the bottom of the lake an amusement park. Permission will be asked of the Mining Commissioner to allow the lake to be drained at his next sitting, probably the first week in June. If the permission is granted work will be started immediately. Two large centrifugal pumps, each with a capacity of 3,000 gallons per minute, will be placed on scows and commence operations. It is the intention to pump into the old outlet which runs round by the Right of Way and La Rose mines, and it is expected that in five months the entire 5,000,000 gallons of water now contained in the lake will be pumped into Lake Temiskaming. The cost of pumping the water from the lake will be in the vicinity of $50,000, while it will release several million ounces.

While the Hudson Bay Mining Company is seeking to consolidate its holdings in the north by developing new fields, it is not neglecting the central property. On two levels ore is being broken from stopes thirty feet wide. The average width of the stopes is from twelve to fourteen feet. There is no definite area of enrichment. Sampling alone determines how wide the rock can be mined at a profit. Stoping this width an average mill head of 22 ounces can be obtained, exclusive of the high grade which is still hand-picked. This ore is being mined for $2.25 per ton, and the twenty-stamp mill is treating on an average of 70 tons per day. The duty per ton last month was 3.67 tons per stamp.

After lying idle for more than eleven months, the first round of holes fired in the north face of the main drift at the 150-foot level of the Bellellen mine, of South Lorrain, showed high grade ore. This was four to six inches wide. Where the drills were started the vein, while it showed native silver, was not classed as high grade. But with the first round of shots last week real bonanza ore as it is reckoned in Cobalt was shown.

The fear of a strike which has been in the air for the past two or three months has been cleared by the decision of the union not even to take a vote on the matter. There was an attempt of the Socialists who have infested the Porcupine camp to force a declaration on the operation of the eight-hour bill, but the good sense of the majority of the members voted them down. The strike leaders from Porcupine descended on the Cobalt camp some weeks before the matter came to a head and succeeded in capturing the organization. They imported some agitators and endeavoured to foment a strike. But the majority of of the miners even in the union were not in favour of industrial disturbance. This is the second time this year that the Cobalt union has declared against a strike in the silver camp.

## BRITISH COLUMBIA

There is little change in the labour situation at British Columbia mines, except that an attempt was being made at the close of April to induce the miners employed by the Western Fuel Co. at its several coal mines in the vicinity of Nanaimo, and those of the Pacific Coast Mines, Ltd., at South Wellington, all on Vancouver Island, to strike. On May 1 the Victoria Times published the following:

"A manifesto has been issued by Robert Foster, president of the United Mine Workers of America, District 28, declaring the commencement to-day of a strike at all the coal mines on Vancouver Island, and requesting all miners to cease work until the companies for which they work concede them an advance in wages.

"This manifesto is the result of orders issued by the Seattle (Washington) representative of the International Union of United Mine Workers, Frank Farrington, who, in issuing instructions for the strike manifesto to Mr. Foster, declared that this was the result of the lack of interest taken by mine-owners on Vancouver island in the invitation to atttend a conference on the subject some months ago.

"The instructions issued call for a strike of all men employed in and around the mines at Nanaimo, South Wellington, and Jingle Pot, the strike to continue until a joint working agreement between the United Mine Workers of District 28 and the mine-owners on the island shall have been secured. The men ask for increased prices for labour and improved conditions of employment.

**No Unlawful Tactics.**—The manifesto, while calling the men out of the mines, asks that every effort be made to prevent unlawful or abusive tactics by the men. The names of all who refuse to respond to the strike call will be blacklisted and published throughout Canada, Great Britain and the United States. A force of men sufficient to protect mining property will be permitted to work so long as the companies shall not attemut to ship coal, but all men not engaged in this way are urged by the manifesto to join the strike, the International Union having promised all the men involved, whether union or non-union, financial support so long as the strike shall last.

"Should all the men at the mines affected by the manifesto go out it will mean that something like 2,000 men will be involved in the strike, although the local agents have not up to the present been apprised of any definite action with respect to the affair."

**Miners Resent Order.**—A despatch from Nanaimo, published in this evening's "Times" (May 2), is as follows: "Mr. Foster's action in calling a general strike was taken without first submitting the question to a vote of the miners concerned. Of the 1,500 employed in the Nanaimo mines, only 200 are members of the organization which has called the strike in the local mines and a large majority of the men resent the action taken by this small minority. A mass meeting of all employees will be held to-night, when a secret ballot will be taken on the question as to whether Nanaimo miners will recognize a strike order of the United Mine Workers. It is said that there will be an overwhelming majority in favor of continuing work, as the men are working under an agreement with the Western Fuel Company, which has still at least five months to run and which they feel in duty bound as honourable men to respect."

It may be added that some time ago the Nanaimo miners refused to go out on strike in sympathy with those at the Cumberland and Extension mines of the Canadian Collieries (Dunsmuir) Limited, and at which non-union labour has since been employed, with an increasingly large number of men working at Cumberland and a commencement made with some 200 men at Extension. Published figures show that during three months ended March 31 the output of coal from the Cumberland mines was 96,818 tons, as follows:—January, 29,541 tons; February, 30,036 tons; March, 37,241 tons. For the week up to April the latest figures at hand, the output was 9,191 tons, or better than 1,500 tons a day.

# PRINCIPLES OF MINE VALUATION*

By JAMES R. FINLAY

I have always supposed, and I think that nearly all mining engineers agree with me, that there are three or four fundamental factors about a mining prope which determine its value. These are:

1. The average cost of securing the products of that mine.

2. The average price at which those products can be sold.

3. The rate of production of the mine.

4. The time for which that output can be maintained.

I do not intend to go into detail as to any of these factors, but to point out some things which I think are worth considering, in the hope that later you will think about them and learn the details for yourselves.

In regard to the average cost: In the case of going concerns, that average cost can be obtained empirically by simple reference to the books—to what has actually been done on the property. That seems and sounds exceedingly simple. As a matter of fact it is not easy. I made the mistake once of thinking that it was. I bought a mine in Joplin, Mo., to be specific, on a record of its cost for six months. The reason I did not go further back was that older records were not to be had, and also because during this particular six months the property had reached a substantial basis. I figured that the concentrates from that mine could be produced perty should produce so much ore and that the price would be a certain figure. It happened that developments proved that I was right about the price and the quantity of ore on the property, but they also proved that I was wrong on the question of costs. It cost us nearly 75 per cent. more to produce concentrates from that ore than the record of the property showed. There were times when we produced concentrates for $15 a ton, but that was not representative of the while period of working the mine. I think you will find today that a great many of the cost statements given out by different companies for fixing the value of their stocks are only temporary or occasional costs, and will not stand analysis, and cannot be maintained during the whole life of the property.

Then there is another factor in which people deceive themselves, unconsciously, but in the simplest and most obvious ways imaginable. They keep on doing it, always have done it, and I suppose always will do it. That is, by failing to see the relation between expenditures that are for plant and those for keeping it going. In keeping books it is very easy to say that the construction of a building, the remodeling of a mine, or the building of a new mill, is something that will not happen again, that it belongs to the property and not to the operation; to a certain extent that is true, but it is a fact, which I have verified by looking up a great number of mines, that the so-called operating costs are ordinarily not more than 60 to 80 per cent. of the total cost. Until a mine is shut down, there is always some expenditure to be undertaken which a bookkeeper may think will not be repeated, that it belongs to the plant, but these things keep occurring so constantly that one who is figuring on costs must count on them. That is, to form an estimate that is correct or approximately correct will require a good deal of judgment and experience.

Another thing I believe to be true is that any estimate of cost, or valuation, or anything relating to the future, is a good deal of a guess. One who thinks he can estimate a cost, whether of a going concern or a concern to be started, to a fraction of a cent, or to any fixed amount is simply mistaken. All you can do is to put a round figure which seems to be pretty near the facts. Of course, the difficulty of estimating costs at a mine which is not yet opened is considerably greater than at a mine that is going, for very obvious reasons.

The next fundamental factor in forming an idea of the value of a mine is the average price of its product. I will go so far as to say that this is the most important factor to be considered. The literature on this subject, I think, has not done justice to the importance of prices because apparently a good deal of the best thought given to the subpect of valuations has been by English engineers who had in mind principally gold mines. Gold, of course, is the only product of mines the value of which is fixed; consequently most of the discussions on mine valuation among engineers have been devoted to the third factor, which I will come to later, viz., the uncertainties in amount of ore in a mine and the part that deveolped ore plays in the estimate of a total valuation.

*An address delivered at The Columbia School of Mines.

As an example of the tremendous importance of the price of a product in mine valuation, I will cite from my report on the Michigan mines. At the time of that report, the price of copper was 12¼c. per pound. A group of copper mines in Michigan were producing, and had been producing 200,000,000 lb. of copper per year at a cost of 10c. per pound, in round figures. I valued the mines on the assumption that the average price of copper would be 14c. per pound as against the current price of 12¼c., and I put a valuation of about $70,000,000 on that basis. Roughly, at 14c. a pound, the earnings would be $8,000,000 a year, and the total value of the group would be nine times that, or $70,000,000. You will find it is a difficult thing in commercial transactions to figure steadfastly on a price that is different from the present price. When I talked about copper averaging 14c. a pound, many said, "That is not the present price, it is 12¼c." Some thought the price might go even lower instead of higher. I think if I had not been prepared by several years' study of that very subject, I would certainly have used a lower figure than 14c. a pound for the average price of copper. At any rate, the value I put on them was nine times their annual income at 14c. If I had used the current price of 12¼c., their annual income would have been only $4,500,000. As a matter of fact, within less than 12 months after the report was made the price of copper had gone up to 17¾c., and the usual proportion of people thought that the price would go still higher, and that this might be the average. If it had been the average, the earnings of these mines would have been nearly $15,500,000 at that price of copper.

Now let us look at what these figures mean in terms of the life of a mine. If I had figured that the mines were worth $70,000,000 at a price of 12¼c. per pound, I would have had to believe that the mines, on the average, were good for 40 years' life, instead of about 13 years. If, on the other hand, I had assumed that the price would be 17¾c., in order to make the mines worth the price I put on them they would have to last only five or six years. Therefore the fluctuations of price in less than a year corresponded to an extension in the life of those mines from five or six years to 35 or 40 years. Here again I am dealing in a mere approximation. I suppose these mines produce about 20 lb. of copper per ton; therefore to get 200,000,000 lb. of copper per year you would have to mine 10,000,000 tons. Therefore, the figures that I actually used meant that I believed there was 130,000,000 tons of copper ore which could be depended on. That is an enormous amount of ore. Figured roughly, that would mean a lode of solid ore five miles long, of the average width of 12 ft., and 5,000 ft. deep; it was actually obtained by projecting the production of the mines and the development of the mines far below their present position. Now if I had to estimate on 12¼c. copper, I would have had to figure on 40 years' life, or I would have had to believe that there were 270,000,000 more tons there than I thought I was justified in believing. On the other hand, if we put the value at 17¾c., I should have had to figure on only 50,000,000 or 60,000,000 tons of ore. Therefore, I say, as affecting the values of mines, the actual fluctuations of price within one year were equal to an uncertainty in the ore production in those mines of more than 300,000,000 tons. An engineer is not likely to make a mistake like that with mines so fully developed as these Michigan properties, many of which are worked to a great depth, are well managed, and have their outlines very well shown. He could, however, easily make just as important a mistake as that in figuring on his average price of copper.

As a matter of fact, I do not think the 14c. price I used was an accurate figure. I have believed that copper would average more than 15c. per pound, taking into view the development of the business, but 14c. was as far as I thought I could go. I do know that mines have been valued within the last five years on prices estimated all the way from 12c. to 20c. Just imagine what a difference that makes in the estimated value of those mines! I know a very important mine in Mexico, the organizers of which believed that copper would not average less than 20c. per pound. I know of mines, on the other hand, that are being valued on an expectation of 12½c. per pound. The same uncertainty applies to all kinds of metals.

I ran against the same difficulty with another group of mines during that same Michigan study. In the iron mines I assumed a price for iron which happened to be almost the same as the price for the year 1911, which was a dull year in the iron business. In this case, however, the price, instead of going up, as the price of copper did, went down about 50c. a ton the next year. Now the margin of profit for those iron mines, during the period that I figured on, was just about $1 a ton, so that if you take off 50c. a ton you cut the profits in two. Of course, during all this last year, I have been exposed to a good deal of criticism by the iron miners, because they say I assumed a wrong price. While it may have been wrong for the year 1912, I notice that prices for the year 1913 have been fixed lately and at a figure very close to my average, in fact, almost identical with it if certain reductions in freight rates be considered.

In both the iron and copper calculations, I have been asked a great many questions as to how I arrived at the prices I assumed. Here there are certain evidences which can be used as guides, and are well worth studying. One general fact about the prices of all mining products is that they vary in cycles or in waves, irregularly of course. If, after a period of high prices, you find that prices are definitely going down and reach a new level, it is pretty safe to believe that the lower level of prices will continue several years. On the other hand, after a period of low prices, when once the metal rises markedly, it is pretty safe to assume that it will stay at a higher level for several years. Those fluctuations are things very well worth studying. It is a matter on which you cannot form opinions right away. You will find in a year from now that you will be justified in holding a different idea from the one you may have at present.

The valuation of a mine, while in the long run it depends on the average, is influenced a good deal by the present price. If you have a copper mine that is going to last ten years, and you expect 18-c. copper for three years out of those ten, it is a matter of considerable consequence to your property whether that 18-c. price comes during the first three years or during the last three years of the life of your mine. If it comes in the first three years you will get your profits and may invest them, perhaps in other directions, and the interest on that money for the following years will be worth a great deal to you. I must confess, in regard to the question of profits, that I was wrong when I wrote my book on the "Cost of Mining" in laying too much stress on average price. I now believe the public is right when it puts a higher value on properties during periods of high prices for metals. That is merely an assertion which I offer you to think about.

(To be continued.)

## STATISTICS AND RETURNS

### BRITISH COLUMBIA ORE SHIPMENTS.

For Week Ending May 3rd.

**Rossland.**

| | Week. | Year. |
|---|---|---|
| Le Roi No. 2, milled | 350 | 6,300 |
| Centre Star | 3,064 | 50,880 |
| Le Roi | 1,050 | 21,559 |
| Le Roi No. 2 | 608 | 7,798 |
| Other mines | ... | 102 |
| Total | 5,072 | 86,639 |

**East Kootenay.**

| | | |
|---|---|---|
| Sullivan | 864 | 13,468 |
| Other mines | ... | 488 |
| Total | 684 | 13,956 |

**Nelson.**

| | | |
|---|---|---|
| Mother Lode, milled | 500 | 9,000 |
| Second Relief, milled | 200 | 3,600 |
| Queen, milled | 350 | 3,675 |
| Other mines | ... | 7,601 |
| Total | 1,050 | 23,876 |

**Lardeau.**

| | | |
|---|---|---|
| Other mines | ... | 137 |

**Slocan and Ainsworth.**

| | | |
|---|---|---|
| Standard, milled | 500 | 9,000 |
| Van Roi, milled | 1,100 | 19,900 |
| Bluebell, milled | 1,200 | 21,400 |
| Kilo, milled | 100 | 1,800 |
| Rambler-Cariboo, milled | 300 | 5,400 |
| Standard | 368 | 5,387 |
| Rambler-Cariboo | 33 | 1,055 |
| Florence | 16 | 469 |
| Other mines | ... | 4,638 |
| Total | 3,617 | 69,049 |

**Boundary.**

| | | |
|---|---|---|
| Nickle Plate, milled | 1,500 | 27,000 |
| Granby | 25,968 | 419,918 |
| Mother Lode | 7,130 | 117,330 |
| Rawhide | 4,835 | 91,152 |
| Napoleon | 756 | 13,552 |
| Unnamed | 106 | 9,608 |
| Knob Hill | 54 | 1,021 |
| Ben Hur | 275 | 3,243 |
| United Copper | 32 | 1,565 |
| No. 7 | 132 | 2,282 |
| Hope | 51 | 357 |
| Other mnies | ... | 4,278 |
| Total | 40,839 | 717,406 |

**B. C. Copper Co.'s Receipts.**

Greenwood, B.C.

| | | |
|---|---|---|
| Mother Lode | 7,130 | 117,330 |
| Rawhide | 4,835 | 91,152 |
| Napoleon | 756 | 13,552 |
| Queen Victoria | 409 | 9,608 |
| Unnamed | 106 | 9,608 |
| Total | 13,236 | 233,633 |

**Consolidated Co.'s Receipts.**

Trail, B.C.

| | | |
|---|---|---|
| Centre Star | 3,064 | 50,880 |
| Le Roi | 1,050 | 21,559 |
| Le Roi No. 2 | 608 | 7,798 |
| Sullivan | 864 | 13,468 |
| Standard | 368 | 5,387 |
| Rambler-Cariboo | 33 | 1,055 |
| Florence | 16 | 469 |
| Knob Hill | 54 | 1,021 |
| Ben Hur | 275 | 3,243 |
| United Copper | 32 | 1,565 |
| No. 7 | 132 | 2,282 |
| Hope | 51 | 357 |
| Other mines | ... | 15,610 |
| Total | 6,547 | 150,894 |

### COBALT ORE SHIPMENTS.

Cobalt, May 10.—The feature of the week is the discovery at the Cochrane, which will indirectly mean a considerable amount of prospecting activity in southeast Coleman again.

The shipments for the week in pounds are:—

| Mine. | High. | Low. | Pounds. |
|---|---|---|---|
| Coniagas | 3 | .. | 201,615 |
| Trethewey | 1 | .. | 49,550 |
| Nipissing | .. | 1 | 52,691 |
| Dom. Red | 1 | .. | 87,311 |
| Hudson Bay | 1 | .. | 63,225 |
| Cobalt Townsite | 2 | .. | 104,540 |
| McKinley-Darragh | 1 | .. | 60,210 |
| Kerr Lake | 1 | .. | 60,210 |
| | 10 | 1 | 683,501 |

The shipments from the Cobalt mines to date are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Coniagas | 21 | .. | 682.20 |
| Trethewey | 5 | 5 | 277.77 |
| Nipissing | 2 | 21 | 764.63 |
| Dom. Red | 7 | .. | 225.81 |
| Hudson Bay | 7 | .. | 231.83 |
| Cobalt Townsite | 22 | .. | 795.06 |
| MKinley-Darragh | 24 | .. | 822.94 |
| Kerr Lake | 8 | .. | 295.14 |
| Beaver | 5 | .. | 135.98 |
| La Rose | 24 | .. | 1,005.24 |
| Peterson Lake (Seneca-Sup.) | 3 | 3 | 220.40 |
| Temiskaming | 8 | 1 | 278.61 |
| Crown Reserve | 5 | .. | 249.95 |
| Chambers-Ferland | 1 | 4 | 159.20 |
| Colonial | 1 | .. | 21.56 |
| Cobalt Lake | 8 | .. | 140.52 |
| Penn. Canadian | 1 | .. | 32.06 |
| Drummond | 8 | .. | 219.59 |
| General Mines | | .. | 8.80 |
| O'Brien | 4 | .. | 156.75 |
| Silver Queen | .. | .. | 60.34 |
| Bailey | 3 | 1 | 182.15 |
| Casey Cobalt | 3 | .. | 109.72 |
| Right of Way | .. | 2 | 62.19 |
| City of Cobalt | 3 | .. | 109.50 |
| Silver Bar | 1 | .. | 20.00 |
| | 170 | 48 | 11,017.82 |

The bullion shippers this week were:—

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 94 | 114,663.83 | $68,798.30 |
| Buffalo | 46 | 45,897.91 | 28,000.00 |
| Crown Reserve | 34 | 37,600.00 | 22,660.00 |
| Dom. Red | 28 | 30,933.00 | 18,559.00 |
| Townsite | 6 | 4,139.00 | 2,438.00 |
| Miscellaneous | 3 | 1,622.00 | 873.00 |
| | 211 | 234,855.74 | $141,429.10 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Building, Toronto, Ont.)

May 8th, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 2.87½ | 3.00 |
| Chino Copper | 29.37½ | 29.50 |
| El Paso | 3.62½ | 3.87½ |
| Goldfield Con. | 1.87½ | 2.00 |
| Giroux Copper | 2.12½ | 2.37½ |
| Miami Copepr | 22.50 | 23.00 |
| Ray Con. Copper | 18.00 | 18.50 |
| Nevada Con. Copper | 16.75 | 17.00 |
| nited Cigars Stores | 89.25 | 89.75 |
| Tonopah Mining | 5.62½ | 5.75 |
| Tonopah Belmont | 6.42½ | 6.25 |
| Greene Can. | 6.62½ | 6.87½ |
| American Marconi | 5.25 | 5.75 |
| Canadian Marconi | 3.00 | 3.25 |
| Houston Oil | 18.50 | 20.50 |
| Houston Oil Pfd. | 58.00 | 63.00 |
| Standard Oil of New Jersey | 350.00 | 352.00 |
| Standard Oil, Old Stock | 1040.00 | 1100.00 |
| Standard Oil Subs | 690.00 | 800.00 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey | .09⅛ | .09½ |
| Beaver | .36 | .36½ |
| Buffalo | 1.90 | 2.30 |
| Canadian G. & S. | .20 | .22 |
| City of Cobalt | .45 | .46 |
| Cobalt Lake | .64 | .67 |
| Chambers-Ferland | .21½ | .23 |
| Coniagas | 7.70 | 8.20 |
| Crown Reserve | 3.70 | 4.00 |
| Foster | .08½ | .09½ |
| Gifford | .05 | .06 |
| Great Northern | .12½ | .13 |
| Gould Cons. | .02 | .02¼ |
| Green Meehan | .00¾ | .01 |
| Hargraves | .05 | .06 |
| Hudson Bay | 65.00 | 70.00 |
| Kerr Lake | 3.20 | 3.30 |
| La Rose | 2.45 | 2.60 |
| Little Nip | .00⅞ | .01 |
| McKinley-Darragh-Savage | 1.94 | 1.95 |
| Nipissing | 8.70 | 8.90 |
| Ophir | .03½ | .05 |
| Otisse | .01¾ | .02 |
| Peterson Lake | .21½ | .22 |
| Rochester | .02½ | .03½ |
| Right of Way | .05 | .06 |
| Silver Leaf | .03 | .03½ |
| Silver Queen | .04½ | .05½ |
| Temiskaming | .33½ | .34 |
| Trethewey | .33 | .36 |
| Wettlaufer | .14 | .15 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .02 | .02½ |
| Crown Chartered | .00¾ | .01 |
| Dome Extension | .08½ | .09 |
| Dome Lake | 2.25 | 2.30 |
| Foley-O'Brien | .27 | .29 |
| Hollinger | 17.00 | 17.40 |
| Jupiter | .49 | .50 |
| McIntyre | 3.00 | 3.25 |
| Moneta | .06½ | .08 |
| Porcupine Gold | .18 | .19 |
| Porcupine Imperial | .03 | .03¼ |
| Porcupine Tisdale | .02 | .02¼ |
| Preston East Dome | .03½ | .04 |
| Rea Mines | .29 | .40 |
| Swastika | .08 | .08½ |
| West Dome | .20 | .24 |
| North Dome | .30 | .60 |

### Sundry.

| | Bid. | Ask. |
|---|---|---|
| Island Smelters | .01 | .01⅛ |
| Cochrane | 1.60 | 1.80 |

## TORONTO MARKETS.

May 12th—(Quotations from Canada Metal Co., Toronto).

Spelter, 6¼ cents per pound.
Lead, 5¼ cents per pound.
Tim, 52 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 11 to 15 cents per pound.

May 12th—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.50 to $21.00 (f.o.b. Toronto).
Midland No. 2, $20.50 to $21.00 (f.o.b. Toronto).

## GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75 per ton.
Coal, bituminous, $3.50 to $4.50 per 1¼-inch lump.

### Coke.

May 9th—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $2 to $2.25 per ton.
Foundry coke, prompt, $3 to $3.50 per ton.

May 9th—Tin, straits, 50.25 cents.

Copper, Prime Lake, $50.25.
Electrolytic Copper, $15.60 to $15.70.
Copper wire, $16.75 to $17.
Lead, $4.35 to $4.40.
Spelter, $5.50 to $5.60.
Sheet zinc (f.o.b. smelter), $7.75.
Antimony, Cookson's, $8.80.
Aluminium, $26.50 to $26.62½.
Nickel, $40 to $45.
Platinum, ordinary, $46 per ounce.
Platinum, hard, $51 per ounce.
Bismuth, $1.75 to $2 per pound.
Quicksilver, $39 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| April 26 | 60⅜ | 27 13/16 |
| " 28 | 60⅞ | 28 1/16 |
| " 29 | 60⅝ | 27 15/16 |
| " 30 | 60⅝ | 27 15/16 |
| May 1 | 60 | 27 11/16 |
| " 2 | 60⅛ | 27 11/16 |
| " 3 | 60¼ | 27¾ |
| " 5 | 60 | 27⅝ |
| " 6 | 60 | 27⅝ |
| " 7 | 60⅛ | 27 11/16 |
| " 8 | 60 | 27 11/16 |
| " 9 | 60¼ | 27 13/16 |

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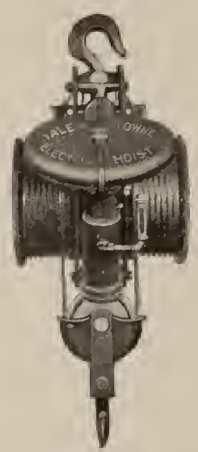

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# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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# PROVINCE OF QUEBEC

## Department of Colonization, Mines, and Fisheries

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
**HALIFAX, N. S.**

# Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HON. W. H. HEARST,**

Minister of Lands, Forests and Mines,

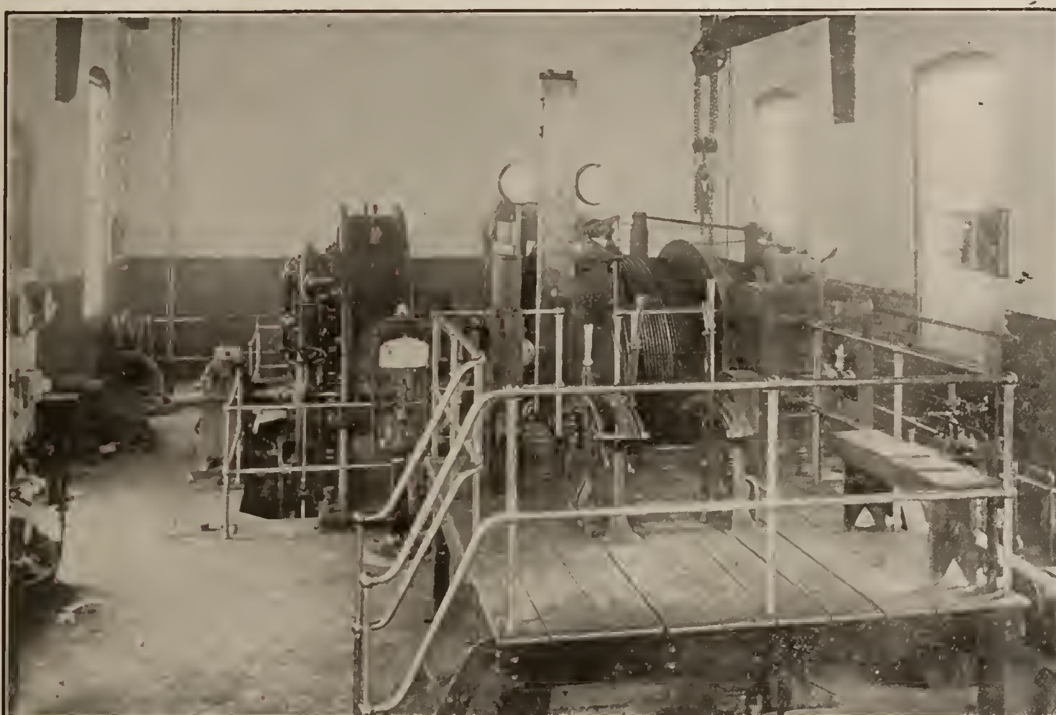
**Toronto, Canada.**

# ALPHABETICAL INDEX TO ADVERTISERS

SIEMENS BROS. DYNAMO WORKS | SIEMENS BROS. & CO.

# SIEMENS

SIEMENS—SCHUCKERTWERKE | SIEMENS & HALSKE



## Siemens Electric Hoisting Engine supplied and installed by us for the Dominion Coal Co., Cape Breton

**Output 185 short tons per hour from a 5000 foot slope, peak load 1320 H.P.**

**We have supplied or on order for Canada the following Electric Hoisting Engines:**

| | | |
|---|---|---|
| 1—1900 H.P. | Peak Load, | Dominion Coal Company. |
| 1—1900 H.P. | " " | Dominion Coal Company. |
| 1—1560 H.P. | " " | Canadian Collieries, British Columbia. |
| 1—1320 H.P. | " " | Dominion Coal Co., (in operation). |
| 1— 750 H.P. | " " | Canadian Collieries, British Columbia. |
| 1— 400 H.P. | " " | Dominion Coal Co., (in operation). |
| 1— 450 H.P. | " " | Acadia Coal Co., (in operation). |
| 1— 450 H.P. | " " | Acadia Coal Co., (in operation). |

The Siemens Companies undertake the complete electrical equipment of mines, collieries, factories, steel works, rolling mills, pulp and pape mills, and electrical plants of every description. Over 200 electrically driven hoisting engines have been installed with peak load from 500 H.P. to 5000 H.P.

Further information will be gladly furnished on request, and schemes prepared showing the economy of electric drive over steam winding.

# Siemens Company of Canada, Limited

HEAD OFFICE
TRANSPORTATION BUILDING - MONTREAL

BRANCH OFFICES:

STANDARD BANK BUILDING
TORONTO

McARTHUR BUILDING
WINNIPEG

# The Canadian Miner's Buying Directory.

**Amalgamators—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos Hayes & Son, 124 Yonge St. Toronto.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.
The John Inglis Co., Ltd.

**Beams—Steel—**
Dominion Bridge Co. ... ...
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Belting—**
Canada Foundry Co., Ltd.
Mussens, Limited.
Northern Canada Supply Co.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.
Federal Engineering Co., Ltd.

**Blasting Batteries and Supplies—**
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
John Davis & Sons.
Mussens, Limited.
Canadian Explosives, Ltd.
Northern Canada Supply Co.

**Blowers—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.

**Boilers—**
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
The John Inglis Co., Ltd.

**Buckets—**
Peacock Bros.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.
Northern Canada Supply Co.

**Building—Steel Frame—**
Dominion Bridge Co.
Canada Foundry Co.

**Cable — Aerial and Underground—**
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Cableways—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Fried. Krupp A.-G. Grusonwerk.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.
Northern Canada Suppiy Co.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Northern Canada Suppiy Co.
Jenckes Machine Co.
Peacock Bros.

**Castings—**
John McDougall Caledonian Iron Works Co.
E. Leonard & Sons.
Peacock Bros.
The John Inglis Co., Ltd.

**Cement Machinery—**
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.
Northern Canada Supply Co.

**Cement Testing—**
Campbell & Deyell.
Can. Laboratories.

**Chain—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
Northern Canada Supply Co.

**Chemists—**
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Cutters—**
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

**Coal Handling Machinery—**
Jeffrey Mfg. Co.
M. Beatty & Sons.

**Coal Mining Explosives—**
Curtis & Harvey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.

**Coal Punchers—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

**Compressors—Air—**
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Northern Canada Supply Co.
The John Inglis Co., Ltd.
Walker Brothers.

**Concentrators and Jigs—**
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Fried. Krupp A.-G. Grusonwerk.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.
Northern Canada Supply Co.

**Condensers—**
Allis-Chalmers-Bullock, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Lauric & Lamb.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Converters—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

**Conveyors—Belt—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Fried. Krupp A.-G. Grusonwerk.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
Fried. Krupp A.-G. Grusonwerk.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Driers—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Drills, Air and Hammer—**
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.
Northern Canada Supply Co.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Canada Foundry.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.
Northern Canada Supply Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.

**Drills—Electric—**
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dumps—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
Canadian Explosives.
Northern Canada Supply Co.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Bros.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Elevators—**
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works.
Northern Canada Supply Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.

**Elevator Buckets—**
Northern Canada Supply Co.
Mussens, Limited.

**Engineering Instruments—**
C. L. Berger & Sons.
Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock, Ltd.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
The John Inglis Co., Ltd.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock, Ltd.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonian Iron Works, Ltd.

**Excavators—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Northern Canada Supply Co.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

Smart-Turner Machine Co.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Generators—**
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Galvanized Strand—**
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Girders—Steel—**
Dominion Bridge Co.

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jeckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Injectors—**
Mussens, Limited.
Northern Canada Supply Co.
Peacock Bros.

**Jacks—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Levels and Rules—**
Northern Canada Supply Co.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Co. of Can., Ltd.
Allis-Chalmers-Bullock, Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.
Hardy Patent Pick.

**Picks—Steel—**
Mussens, Limited.
Hardy Patent Pick.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Bros.

**Pipes—Rivetted—**
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pielsometers—**
Mussens, Limited.
Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
E. Leonard & Sons.

**Pumps—Sinking—**
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

**Rolling Mill Machinery—**
Fried. Krupp A.-G. Grusonwerk.

**Rolls—Crushing—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.

**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Northern Canada Supply Co.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

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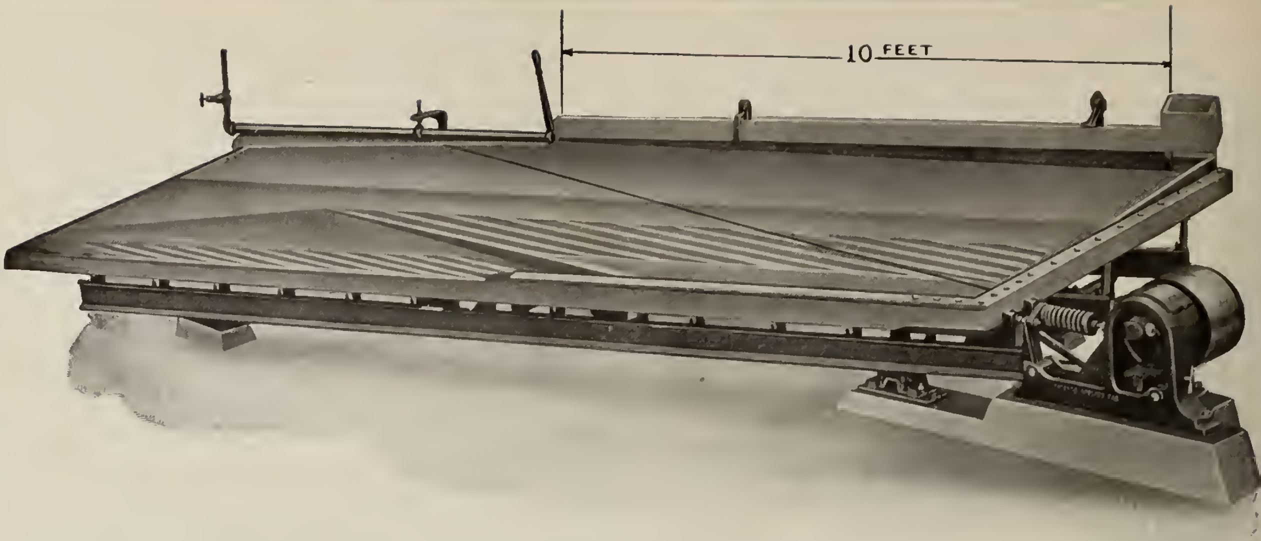


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# THE CANADIAN MINING JOURNAL

OL 34 TORONTO No. 11

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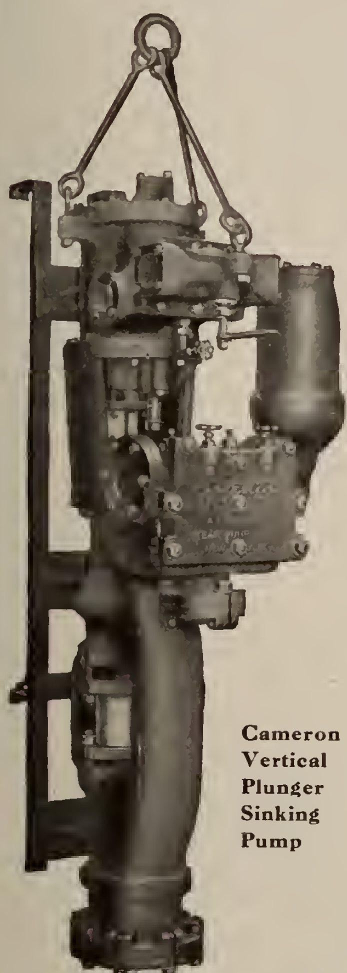

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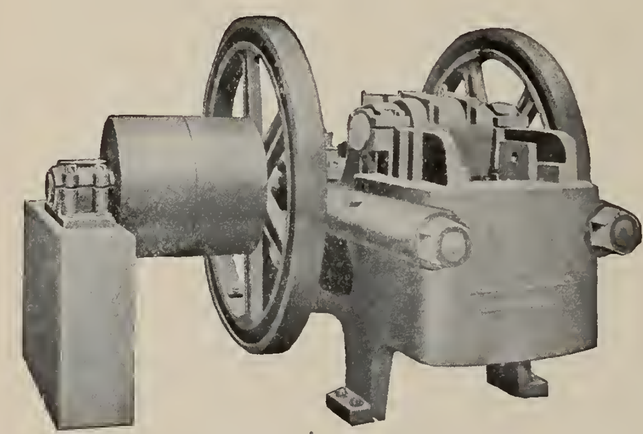

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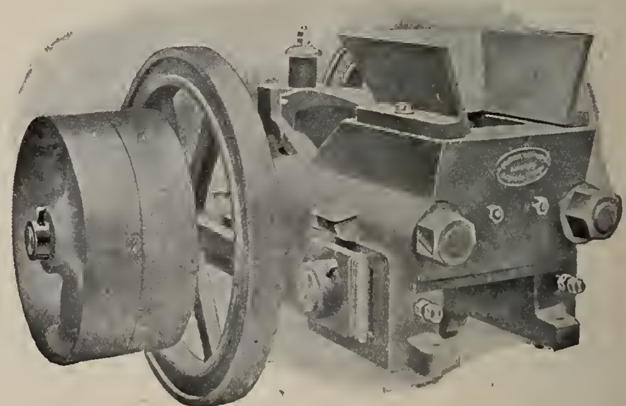

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, June 1, 1913. No. 11

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CONTENTS.



## PROGRESS IN ALASKA

The report of the Mines Inspector for the Territory of Alaska has just been issued. The period covered is the fiscal year ended June 30, 1912.

The figures of production, we note, are carried only to the end of the calendar year 1911.

The total value of the mineral production of Alaska during the year 1911, was $20,650,005. By far the greater proportion of this was gold, which metal was mined to the value of nearly $17,000,000. The production of copper, however, has grown very markedly, its total value reaching the respectable sum of $3,666,584. The silver production was of relatively small value, and coal practically nothing. As a matter of fact, only 900 tons of coal were produced in Alaska, while practically 90,000 tons were purchased from British Columbia. The production of other minerals, such as marble, gypsum, tin, lead, etc., aggregated a value of $176,942.

Of the gold, approximately $12,500,000 was derived from placers, four and a quarter million from silicious ores, and $86,000 from copper ores. After reaching a maximum value of about $22,000,000 in the year 1906, the gold production of Alaska has fluctuated between a gross value of sixteen and twenty million dollars.

The silver production has gone up from about 50,000 ounces to a present output of nearly half a million ounces. While the copper production took a tremendous leap as between the years 1910 and 1911, in the former year, 1910, the production was four and a quarter million pounds, in 1912 the production was 27,267,871 pounds.

The Yukon basin is still the largest regional source of gold, with the Pacific Coast belt coming next, and the Seward Peninsula third.

It may be noted that the consumption of crude oil and naphtha has increased markedly in the last five years. In 1911 more than 18,000,000 gallons of crude oil, and a million and a quarter gallons of naphtha were shipped from other parts of the United States to Alaska.

It is gratifying to notice that the inspector reports the organization of mine rescue and first aid teams on Douglas Island. The work has also been taken up at a number of lode mines.

Considering all the conditions of work, the scale of wages is relatively low. The miners in the Fairbanks district get from $3.50 to $5.00 a day and board. At Nome the rates are higher, except during the winter. The ten-hour shift predominates. There is little, if any, labour trouble.

The extraordinary short sightedness of one United States federal administration has rendered it impossible to develop the Nome coal resources of Alaska. While this is in itself a vain and foolish thing, and is to be directly attributed to the insane overdoing of the conservation idea, yet it has inured to the benefit of British Columbia coal mines. Our readers may possibly remember that when Mr. Gifford Pinchot, the evangel of conservation, visited Alaska, the inhabitants were reported to have clothed themselves in the darkest mourning, and to have put all the flags at half mast.

Despite a short-sighted Federal Government, there appears to be reason to believe that Alaska will soon come into her own.

## THE LEAD BOUNTIES

The Budget speech of Honourable Mr. W. T. White contained the pleasing announcement that the Dominion lead bounties are to be continued. This, of course, will be excellent news for our friends in the West.

The huge surplus of $55,000,000 permits the present Government to deal liberally with such industries as legitimately need assistance.

In the course of the Honourable Mr. White's speech, he devoted considerable attention to the lead bounties. Provision for the payment of these bounties expires on June 30 of this year. The total appropriation set aside in 1903 was $6,000,000. On account of the high market price of lead not all of this was expended. In fact, there will be $600,000 unexpended on July 1st, 1913.

The proposal is to extend these bounties for five years, the necessary appropriation to include the unexpended $600,000. When the price of lead in the London markets exceeds 17 pounds, 8 shillings, 9 pence per ton, the bounty automatically is withdrawn until such time as the price falls.

It is a matter of record that since the inception of the bounties, the Canadian production of lead has increased from about 8,000,000 pounds to 34,000,000 pounds.

Incidentally, we may express our approval of the reduction of the tariff on cement. Slight as this reduction is, it will mean something to the Canadian purchaser.

## THE INTERNATIONAL GEOLOGICAL CONGRESS

The third circular of the International Geological Congress has just come to hand. This is to be the last general circular. Further official information will be sent only to actual members of the Congress. As applications to join the excursion are exceeding all expectations, it is decidedly necessary that those who have not applied for membership do so at once. This particularly applies to appointed delegates who have not yet sent in applications, nor designated the excursions in which they desire to participate.

regards excursions. One in particular, excursion A9, will start from Kingston. Another excursion, C1, will be modified so as to eliminate the visit to Munson on Sept. 3. Still another change in excursions CI, and CII will time the visit to the Sudbury nickel copper deposits for the beginning, and not the end of these excursions.

As matters stand now, the date for leaving Montreal for Quebec and the Maritime Provinces is fixed for Sunday, July 13; for leaving Montreal for Sudbury, Cobalt, and Porcupine, Wednesday, July 23; for leaving Montreal for Haliburton and Bancroft, July 24; and the opening day is set for Thursday, Aug. 7th, in Toronto.

Members of the Congress may secure single tickets at half the lowest, one way, first-class fare. Round trip tickets may be secured at the price of the lowest, one-way, first-class fare, provided the same route be followed going and returning. Tickets will be used from July 15th to Oct. 31, 1913, but cannot be used or purchased after the latter date. These arrangements apply only to professional members, non-professional members are, however, granted almost equivalent privileges.

Since the fee for membership is only $5.00, all those desiring to join any of the excursions should apply at once to the secretary, Victoria Museum, Ottawa.

It may be noted here, that the monograph on the coal resources of the world is to be published in the form of three, not two, quarto volumes, and a folio atlas.

All possible arrangements have been made for the convenience of excursionists. On another page will be found a reproduction of part of the third official circular.

## A SUGGESTION FROM THE WEST

The British Columbia Mining Association has placed itself on record as appreciating highly the work of Mr. R. F. Green, M.P. for Kootenay, B.C. To his hard work, and to the clear-sightedness of the Honourable Mr. W. T. White, is attributed the continuance of the lead bonus.

At the same meeting the Ottawa Government was again strongly requested to create a separate Portfolio of Mines at Ottawa. To this request was joined the suggestion that Mr. Green be appointed Minister of Mines.

While the suggestion of creating a separate Portfolio of Mines is one in which we thoroughly concur, and one that we have been urging for some years, it is our opinion that the British Columbia Mining Association has not acted wisely in beclouding the issue by submitting the name of Mr. Green.

Mr. Green's merits or demerits have nothing to do with the case. The chief point is to convince the government that a Portfolio of Mines is a necessity. After that the matter of selecting the Minister will take care of itself.

## UNITED STATES COAL MINE ACCIDENTS

The monthly statements of coal mine accidents in the United States show a distinct improvement for the months of January and February, 1913. as compared with the corresponding months for the previous year. In January, 1912, there were 243 fatalities in and about coal mines. In February, 1912, there were 207. In January and February of this year, there were respectively 213 and 197. Thus the total for the two first months of this year is less by 40 than the total for the first two months of last year.

It is apparent that since the very inception of the vigorous campaign for installing life saving apparatus, the deaths per thousand men employed have steadily decreased.

For 1912 the figure was 3.15; for 1909 it was 4. Putting it in another way, for each death 233,000 tons of coal were produced in 1912, while for each death in 1909 only 173,000 tons were produced. Unless some disaster of extraordinary magnitude should occur this year the precautionary measures introduced by the United States Bureau of Mines will certainly have demonstrated their value.

## EDITORIAL NOTES

The price of silver is holding most satisfactorily. At the Hollinger mine, Porcupine, the hydro-electric power is again available.

The Crow's Nest Pass Coal Co. reports a decidedly profitable year for 1912. According to their statement net profits of $471,454 are shown.

The Lucky Jim zinc mine of British Columbia has hardly lived up to its name. At present it is reported to be in very serious difficulty owing to an accumulation of debts.

It is reported that the Quebec magnesia deposits have been taken over by a new concern having affiliations with United States investors. The crude material apparently is to be worked up into finished product at Newark, New Jersey.

## BOOK REVIEW

**AIR COMPRESSION AND TRANSMISSION—By H. J. Thorkelson—Associate Professor Steam and Gas Engineering, University of Wisconsin—207 pages—Illustrated with many diagrams and line cuts—Price $2.00—Published by the McGraw-Hill Book Co., 239 West 39th St., New York, 1913—For sale by The Canadian Mining Journal, Toronto.**

There already have been published a number of descriptive text books dealing with the mechanical principles and the actual use of air compression and transmission. In most of these books the attempt has been made to cover the whole subject. Mr. Thorkelson has confined himself to the methods of calculation, whereby the efficiency of any given system may be determined, or the needs of any given mine or other establishment, measured.

After a brief prefatory note in which the author points out that railway men were among the first to appreciate the uses of compressed air in shop and structure work, and that compressed air is used in over sixty different industries at present, the general text commences.

Chapter I. deals with the characteristics of air; Chapter II. with fundamental definitions; Chapter III. with the characteristic and energy equations for air; Chapter IV. with graphical diagrams; Chapter V. with air at pressures below the atmosphere; Chapter V., as indicated by its title, takes up vacuum pumps, the Sprengle air pump, the measurement of vacuums, condenser pumps, etc. The next Chapter has to do with air at low pressures. Under this heading come cupolas, ventilation, measurement of draft, fan efficiency, rotary blowing machines, and other cognate subjects. Chapter VII. is a discussion of piston compressors. Efficiencies and energy compensation form the subject matter of Chapter VIII. Chapter IX. is entitled Multistage Compression. Chapter X. is devoted to the mechanical details of piston air compressors. Chapter XI. touches on the design of turbo-compressors. Chapter XII. which is one of the most interesting in the book, compares the various types of hydraulic air compressors and the general principles involved. We note that the large Cobalt installation is not mentioned here. The effect of altitude on capacity and on power is the topic of Chapter XIII. Chapter XIV. touches the design of receivers, and the measurement and transmission of compressed air.

In the concluding Chapter the selection of compressors and matters pertaining to their general efficiency, are discussed. Three appendices, one a table of Common Logarithms, one a table of Naperian Logarithms, and one a short treatise on Hygrometric, conclude the volume.

### REMOVAL NOTICE.

We wish to notify our readers that the offices of the Canadian Mining Journal have been removed from 10 Adelaide Street East, to the second storey of 44-46 Lombard Street, one-half block north, and two blocks east. The present offices will be much more commodious than those we have left.

The Canadian Mining Journal in its new quarters will possess the distinct advantage of having direct access to its own printing plant, which is housed in the basement of the same building. This fact we would request our readers to bear in mind. The plant referred to, is large and completely equipped.

# THE "DE RE METALLICA" OF GEORGIUS AGRICOLA*

## A REVIEW

(Continued from April 1st Issue.)

The methods of staking mining lands in Germany during the sixteenth century, and the officials that were to be approached, are dealt with in Book IV. The Bergmeister, having satisfied himself as to the discoverer's identity, awarded the "head meer" to him, and the remaining "meers" in order to each successive applicant. The head meer, staked on a fissure vein, measured 42 fathoms by 7 wide, while the ordinary meer was 28 by 7. For other classes of deposits other units obtained. Many restrictions were imposed upon individual operators, and there was quite as much red tape as one finds to-day. These, the duties of the mine manager, the collection of tithes, Agricola explains with care and precision. It appears that in those days the day was divided into three seven-hour shifts—morning, noon, and night. "The Bergmeister" it is noted. "does not allow this third shift to be imposed upon the workmen unless necessity demands it." Truly the height of consideration! When, however, the men were forced to work the third shift Agricola remarks that "they keep their vigil by the night lamps, and... .....they lighten their long and arduous labours by singing, which is neither wholly untrained nor unpleasing." In some places miners were not allowed to work through two successive shifts, in other places the only limiting factor was his own power of endurance. Saturdays and Sundays were regular holidays—Saturdays devoted to shopping and Sundays to "holy things."

The practical work of mining and the art of surveying from the subject-matter of Book V. The advice given as to sinking shafts is that, first, a separate shaft house be built wherein is placed the windlass. Here, also, are kept the iron tools and other mining implements. It is further recommended that adjoining this structure a dwelling be constructed for the mine foreman and workmen. In a quite casual manner Agricola mentions that "the ore and other things which are dug out" are also to be stored in this edifice. Here is a charming sidelight: "Although some persons build only one house, yet because sometimes boys and other living things fall into the shafts, most miners deliberately place one house apart from the other, or at least separate them by a wall."

General instructions follow and illuminating definitions shine like gems throughout. "A tunnel," says Agricola "is a subterranean ditch driven lengthwise and is nearly twice as high as it is broad, and wide enough that workmen and others may be able to pass and carry their loads. It is usually one and a quarter fathoms high, while its width is about three and three-quarters feet......Each miner sits upon small boards fixed securely from the footwall to the hanging wall." We wonder if it would conduce to efficiency and peace of mind were modern workmen required to work in a "subterranean ditch," three and three-quarters feet wide.

Our mediaeval friend had evidently paid much attention to the character and modes of occurrence of ore in advising the miner where and how to sink on his vein. He lays special emphasis upon the functions of stringers and main veins, and upon vein intersections generally. He then discusses with some elaboration the actual relationship of characteristic minerals and metals—a strangely interesting bit of empirical paragenesis. Here are typical statements: "A vein which contains a larger proportion of silver than gold is rarely found to be a rich one......The solidified juices, azure, chrysocolla, orpiment and realgar, also frequently contain gold." As to indications of valuable metals Agricola explains among other things that if the miner comes across "dry earths which contain native or *rudis* metal, that is a good indication; if he comes across yellow, red, black. or some other extraordinary earth, though it is devoid of mineral, it is not a bad indication." Schist of a bluish or blackish colour, and limestone of any colour whatsoever, are good indications of silver. Bismuth and antimony are described as special indications of silver; orpiment as special indication of gold; verdigris, *melanteria,* and vitriol, are taken as indicating copper. It is mentioned that bismuth was called by miners "the roof of silver."

Evently extralateral rights did not obtain in those days, as witness the following: "If it [the vein] descends vertically into the earth, the benefit belongs to that mine in which it is seen first of all; if inclined it benefits the other neighbouring mines. As a result the miner who is not ignorant of geometry can calculate from the other mines the depth at which...... the vein bearing rich metal will wind its way through the rocks into his mine."

The modes of extracting the vein matter are now elucidated. As Agricola wrote before the introduction of explosives into the mine, the principal method of extracting hard ore was by means of fire. A heap of dried logs was placed against the rock and ignited. In many cases this process was not only exceedingly tedious, but it caused distress in neighbouring mines which happened to be connected with that in which fire was being used. Hence permission had to be asked of the owners of neighbouring mines and in the case of arsenical, anitimonial, or sulphurous ores the permission of the "Bergmeister" was necessary. After long calcination the ore was dislodged by means of crowbars and hammers. It was always to be hand sorted in the mine, where fire was not necessary or not permitted the miners had perforce to rely upon purely mechanical means.

The practice of timbering was not, in Agricola's time, as crude as one might expect. Pumping was usually accomplished by hand or by horse power, although mechanical appliances were sometimes used. Surveying, to which the latter part of Book V. is devoted, was practised only in its simplest form. A knowledge of the rudiments of geometry with a touch of trigonometry was the basis of the art.

The sixth book contains descriptions of the tools, vessels and mechanical devices used in the mines. Winding, ventilating and pumping machinery, drills, hammers, picks, are clearly described by text and wood cuts. The barrows and trucks in vogue were exceedingly substantial in design. For baling water small and large wooden buckets fed by means of cumbrous wooden dippers were filled and hoisted by hand to the

* Georgius Agricola De Re Metallica.—Translated from the first Latin edition of 1556 with Biographical Introduction, Annotations, etc., by Herbert Clark Hoover and Lou Henry Hoover.—Published for the Translators by the Mining Magazine, London.—For sale by the Canadian Mining Journal, Toronto, Canada.

surface. These were often replaced by water bags made of ox-hide. "When these water bags have undergone much wear and use, first the hair comes off them and they become bald and shiny. After this they become torn."

The windlass of Agricola's time was essentially a duplicate of many that are to be seen on small prospects to-day. For the deeper shafts, however, a three-man windlass was used, on the barrel of which was fixed a wheel of large diameter which served the purpose of a fly-wheel. While one man turned the crank two other men at the opposite end of the windlass worked upon four straight levers passing through the end of the barrow. "All windlass workers," says Agricola, "whatsoever kind of a machine they may turn, are necessarily robust that they can sustain such great toil."

A third kind of machine was designed to hoist ore from the extraordinary depth of one hundred and eighty feet! This was a vertical two-man hoist. The horse-whim, both single and double, was also in vogue. One illustration shows the rider sitting luxuriously on a cross-beam driving two horses. For transporting the ore from the mine to the furnace all kinds of methods were resorted to. Horses drew rude sledges filled with ore. Pack teams of dogs were common. Where the topography would permit the ore was raw-hided or merely rolled down the mountains. Perhaps the most picturesque method is thus outlined:—Two or three sacks of ore were placed on a small sledge higher in front and lower at the back. "Sitting on these sacks, not without risk of his life, the bold driver guides the sledge as it rushes down the mountain into the valley, with a stick which he carries in his hand."

Pumping was accomplished by various means. Men worked in tread wheels running endless bucket elevators. Hand pumping in various ingenious forms was practised. For greater depths water power was ingeniously applied with sumps established at the different levels. It would be quite impossible to touch upon the quaint designs in use. Suffice it to say every kind of available power was utilized. Not only were men and horses called upon to do their duty, but goats were frequently used in the tread mill.

Rude blowers, fans, and bellows, worked by hand or by horse power provided ventilation or draughts, were induced by ventilating shafts. Water power also was called into service. Means were sometimes taken by structures superimposed on the shaft mouth to catch the wind and divert it down the shaft.

Towards the conclusion of Book VI. Agricola indulges in a little moralizing. Touching on poisonous gases, he remarks on the danger of arsenical poisoning, and mentions that men even in the act of climbing ladders fell back into the shaft when the poison overtakes them. "At such times, no one should descend into the mine or into the neighbouring mines, or if he is in them he should come out quickly." Foremen are adjured to look carefully to the condition of their ladders and the men similarly are advised not to "fall through their own carelessness." Allusion is made to a venomous ant, not found in the mines of which Agricola writes, but in Sardinia. "It creeps unobserved and brings destruction upon those who imprudently sit on it. But......springs of warm and salubrious waters gush out in certain places, which neutralize the venom inserted by the ants." As if to compensate for the absence of these destructive insects Agricola continues. "In some of our mines, however, though in very few, there are other pernicious pests. These are demons of ferocious aspect.......Demons of this kind are expelled and put to flight by prayer and fasting." As subordinate in importance to these diabolical intruders, the chief causes for abandoning mines were barrenness, over much water, noxious gases, falls of rock, and "military operations."

(To be Continued).

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## SILVER VEINS IN SOUTH LORRAIN, ONT.

By J. B. TYRRELL.

In the district of South Lorrain, lying sixteen miles south-east of Cobalt, several rich silver-bearing veins have been opened up and worked to a greater or less extent, and as these veins are similar in character and appearance to those in the older and better known Cobalt camp a brief notice of one, at least, of their peculiarities may be interesting to your readers.

As in the country around Cobalt, the rocks consist of Keewatin greenstones with characteristic intrusive dykes of lamprophyre, etc.; conglomerates which have been designated by the geologists of the Ontario Bureau of Mines as of Huronian age, and great intrusive masses of coarse diabase.

Looking at the map published by the Ontario Bureau of Mines it will be noticed that the western edge of the intrusive diabase runs almost in a straight line from north to south. As a general rule the veins, as far as I have seen them, appear to be near this western edge of the diabase, either to the east of it in the diabase itself or to the west of it in the Keewatin greenstones, for in this district the conglomerates do not appear to have been attractive to the silver-bearing solutions.

I do not know whether the diabase is here in the form of a sill as it is in Cobalt or not. In this latter camp it is now generally recognized that the silver-bearing veins have been formed by the diabase, or rather that they have been in the nature of end products deposited around the periphery of the diabase after the main intrusion had ceased and the rock had cooled below the temperature of solidification. In this camp also the upper and lower surfaces of the diabase sill, or intrusive mass, approximate more or less closely to the horizontal and the fissures caused by the cooling of the rock have, as a rule, been normal to these horizontal surfaces and have therefore approximated more or less closely to the vertical. After the fissures were formed, either in the solidified diabase, or in the contiguous rock, whatever it might happen to be, the silver-bearing solutions flowed into them and filled the fissures that extended up and down from the diabase and formed veins in these fissures.

While emanations from the diabase gave rise to the Cobalt silver veins, it was not always necessary that the wider parts of the veins should be directly in contact with the originating rock, for the solutions bearing the vein-forming material would circulate in any open fissures that happened to be at all within reach of, or connected with, the diabase.

Now in South Lorrain the conditions are very similar to those in Cobalt as briefly outlined above, but, in some instances at all events, the attitude of the plane of contact of the western edge of the diabase and the contiguous rock, which in this case is greenstone, is not horizontal, but nearly vertical, and many of the principal veins run east and west, normal to this plane of contact.

As at Cobalt, the diabase contact is the controlling factor, but instead of the veins running up and down from a horizontal contact, they here run outwards, from and at right angles to a vertical contact, and therefore a horizontal section of a vein, as seen on the surface here, represents what might be looked for in a vertical section in Cobalt. The rich ore-bodies, where they occur, are not found directly at the diabase contact, but at some little distance away from it either in the diabase or in the greenstone, beyond which, as the vein is traced farther and farther from the contact, it becomes narrower and breaks up into veinlets which run out and disappear in the adjoining rock.

Whether the greenstone-diabase contact on the western border of the diabase in South Lorrain will continue downwards vertically, or at a high angle, for any great distance or not is as yet uncertain; but if the contact should maintain its vertical attitude to considerable depths it would seem not improbable that these veins and ore-bodies, which have been formed by emanations from the diabase, might have their greatest extension in a vertical direction, in conformity with the attitude of the plane of contact, rather than in a horizontal direction as is the case with the ore-bodies at Cobalt and in its immediate vicinity.

# MINING AND THE CANADIAN NORTHERN RAILWAY

(Written for the Canadian Mining Journal.)

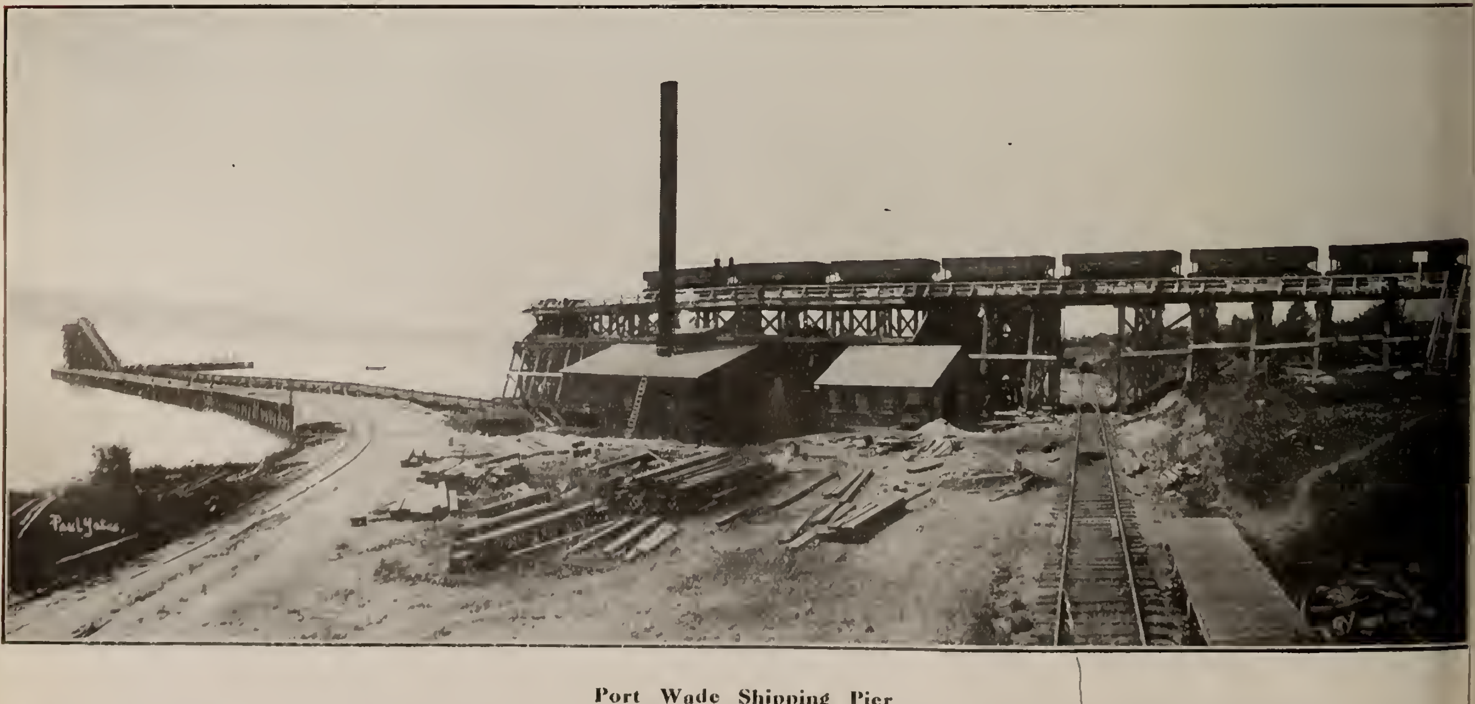
Except for fortunate accidents the general politics pursued by Canadian railway corporations have not untill the last decade or so included any clear cut attitude towards mining. In one sense this is not strange, as our railway magnates have been far too deeply involved in actual construction to attend to anything but immediate necessities. Yet it is beyond argument that had our transportation corporations followed more closely the mining development of the country they would have strengthened their own position decidedly, and would have hastened the inevitable development of mining and other allied industries.

One has but to look over the border at a few of the large railway concerns in the United States to realize what the mine yields in the way of freight traffic. The vast volume of freight that accures to the railways from the coal mines, iron mines, copper mines, and from other mines of all kinds, and the correspondingly large return traffic from the smelters, must be recognized as one of the vital factors in the history of transportation, and in fact, in the prosperity of the whole country.

No large railway can subsist on one class of freight traffic. No single industry can be depended upon to yield such a bulk of freight as can mining. On the other hand, the farmer, the manufacturer, and the merchant invariably follow in the wake of the miner. In other words, a country that is opened up for mining purposes will also be opened up for farming and the general activities of civilization. It is a fact that there are few mining regions in Canada that are not within easy reach of good areable land. Thus the miner, as a pioneer, opens up the road for, first, the agricultural industry, and then for others. Communities are established and traffic of all kinds is created.

Whilst in a great many instances the discovery of important ore deposits in Canada has been the accidental result of railway construction, yet in more instances, discovered mines have had to await for years the construction of the railway This is too obvions a truth to require specific illustration

The following series of articles has to do with the relation of mining to the growth of one large railway corporation; namely, the Canadian Northern Railway. The Canadian Northern has from its inception striven to give direct recognition to the mining industry. This, of course, has not been done in any altruistic spirit. The




Port Wade Shipping Pier


Eastern Lines of Canadian Northern Railway company has been keenly aware of the revenue value of ore tonnage, and consequently has deliberately located its lines to pre-empt as much mining business as possible. The object has ever been, therefore, to accelerate mineral production.

Over the country tapped not only by the main lines, but especially by many of the branch lines of the Canadian Northern, there are practically numberless mineral deposits, many of which are of proved commercial value, and many more of which hold out promise to the prospector and to the investor.

In this short series of articles it will be possible to indicate only in the most general way, the geological character and mineral occurrences throughout the Canadian territories traversed by the Canadian Northern. It will be most convenient to start from the East and work gradually through to the West.

First, however, it may be well to make a few general remarks concerning the relation of transportation to mining Of all the freight handled by the Canadian Northern Railway, at least 33 per cent. is contributed directly by the mining industry. This does not include many metallurgical products, but is made up almost entirely of the direct products of the mine. In the United States the figures are proportionately higher. It gives some idea of how far we shall have to grow to realize that the mining industries of the States contribute nearly 60 per cent. of the freight moved there. Until some such figure is attained in Canada we shall not have attained our normal growth.

Unlike most of the products of the farm, or even of the forest, the mine products that form a source of freight are produced the whole year round Hence their importance to any given railway is hardly to be exaggerated .

Starting then on the west coast of Cape Breton Island, we find the Inverness branch of the Canadian Northern tapping a rich coal region The Inverness colliery itself, which is the present northerly terminal of the line, produces about 300,000 tons of high grade steam coal per year. A large portion of the country, both north and south of Inverness proper, is rich in coal veins. Here is the first instance of what has been mentioned above. The Inverness branch was built primarily to develop the coal fields of the county.

To the north of Inverness, near the north-western extremity of the Island of Cape Breton, there are extensive, though undeveloped, deposits of gold bearing mispickel and copper. There are also commercial deposits of barite, and large bodies of excellent gypsum. All of this region is tributary to the Inverness branch, the southern terminal of which is at Port Tupper on the Straits of Canso.

Beginning at Halifax and running in a south-westerly direction, the Halifax and South Western Railway runs along the Atlantic shore round the southernmost heel of Nova Scotia, to the flourishing city of Yarmouth. Many square miles of the country thus cut are rich in minerals. For instance, at Chester Basin, a point 40 miles from Halifax, small though rich gold veins have been worked for a number of years. Running inland at right angles to the line, a drive of an hour and a half or so, takes one into a region where not only are tin and tungsten minerals known to exist, but manganese in the form of pyrolusite, is being worked to advantage. Along the shore in the vicinity of Liverpool large flake mica has been found, although never as far as is known, worked. In the County of Yarmouth itself the Cambrian gold measures are extensive. Within a comparatively short distance of Middleton (see map) are the enormous Torbrooke and Nictaux iron deposits, both hematite and magnetite which are now being worked by the Canada Iron Corporation. Large quantities of these ores are mined, milled, and shipped as concentrates. The milling process is simple as it consists essentially in crushing and jigging, yet the ore is brought up to a high tenor. As this ore is phosphatic it makes an admirable mixture for burdening the blast furnace for foundry pig. Here again it may be noted that the Canadian Northern constructed the branch line from Middleton to Port Wade, a shipping point on the Bay of Fundy. (See photograph).

The region thus tapped by the Canadian Northern in south-western Nova Scotia is exceedingly rich in gypsum and limestone, and in addition to the Nictaux and Torbrooke iron deposits, has promise of other considerable iron ore bodies.

One great advantage of the Nova Scotian lines is their accessibility from tide water. The inland shipper of heavy mineral products is often placed at a disadvantage owing to the excessive rail hauls. All the distances in Nova Scotia are short, and the harbour facilities at such points as Halifax, Liverpool, Yarmouth, and Port Wade are excellent. Not only is the Canadian St. Lawrence market made available, but the whole Atlantic coast of the United States is directly accessible.

As to the proposed line shown in dots from Quebec through to Pugwash, the general statement may be vouchsafed that the greater proportion of the area traversed is rich in natural resources. Near Fredericton, for instance, antimony veins have been worked. In the vicinity of Moncton enormously rich natural gas deposits are being exploited and developed, and extensive oil shale bodies are soon to form the basis of a huge industry, an industry that will have countless ramifications.

In process of time, iron, copper, and possibly gold and tin deposits will be opened in the New Brunswick section. So far very little prospecting of any kind has been done. Nevertheless there are large positive possibilities that may be mentioned. These include the quarrying of building stones (and this applies equally to Nova Scotia), gypsum, barytes, and limestone. The distribution of fertilizer (ammonium sulphate), from the works that are to be established on the oil shale deposits will mean much. Not least important will be the increasing traffic in the brick manufacturing industry. South-eastern New Brunswick is rich in brick clay. All of these commodities will in time assuredly bring a large amount of traffic to the line. Taking, for instance, the case of gypsum, we discover that of the 450,000 tons quarried in Nova Scotia and New Brunswick the great bulk is shipped crude to the United States, not more than 20,000 tons per annum being manufactured into gypsum products in Nova Scotia. Much of this crude material after being calcined and ground is shipped back from the States into Canada against a substantial duty.

Not only is Nova Scotia third in the value of her annual production of minerals, but the Province is by far and away the most important producer of coal in the Dominion. The annual output of coal is about six and one-half million tons, about 50 per cent. of Canada's whole output.

The following table gives specific figures for the year ending September 30, 1912.

## NOVA SCOTIA MINERAL PRODUCTION.

Year ended September 30th, 1912:

| Mineral. | Quantity 1911. | Quantity 1912. |
|---|---|---|
| Coal raised (gross tons) ....... | 6,208,444 | 6,802,997 |
| *Iron ore (net tons) .......... | 53,595 | none |
| Pig iron made (net tons) ...... | 397,615 | 411,388 |
| Steel ingots made (net tons) ... | 438,922 | 461,392 |
| Limestone quarried (net tons).. | 525,286 | 473,067 |
| Coke made (net tons) ........ | 545,619 | 603,372 |
| Gypsum quarried (net tons)... | 333,358 | 280,000 |
| Building stone quarried (net tons)................... | 11,226 | 11,644 |
| Bricks made (number) ........ | 23,273,700 | 22,348,486 |
| Drain pipe and tile made (feet). | 1,431,761 | 984,922 |
| Grindstones quarried (net tons) | 380 | 400 |
| Gold bearing ore mined (net tons | 18,320 | 15,868 |
| Gold produced (ounces) ....... | 8,389 | 4,948 |
| Manganese ore (net tons) ...... | 150 | 233 |
| Antimony concentrates (net tons) | 191 | none |
| Moulding sand (net tons) ...... | 380 | 1,190 |
| Tungsten concentrates (net tons) | none | 14 |
| Sulphate of Ammonia (gross tons).................... | 3,971 | 5,213 |
| Barytes .................... | | 974 |

*Iron ore imported 1910-11, 853,904. 1911-12, 880,904 net tons. Operations at Torbrook mill not up to capacity.

The value of the annual mineral production of the Province divided by the number of square miles of territory is about $1,100 per square miles. This works out at nearly $50.00 per capita.

### GEOLOGY.

The geology of the regions dealt with in this article can be best described by quoting from a monograph written by Dr. G. A. Young, and published by the Geological Survey of Canada. The following paragraphs are made up of isolated sentences from Dr. Young's text.

The southeastern portion of Quebec, together with the Maritime Provinces, form the northeastern extension of the Appalachian Mountain system. The Appalachian region is characterized by formations, ranging from pre-Cambrian to Carboniferous, that are disturbed and thrown into a succession of folds. Important deposits of coal, iron, and gold are mined in Nova Scotia. Its coal resources have been estimated by the Hon. R. Drummond to be six billion tons.

The gold bearing series of Nova Scotia, together with great instrusive measures of later granites, occupy the whole Atlantic coast of the peninsula extending in the southwest, almost completely across it. and underlying in all an area of some six or seven thousand square miles. This series, consisting of a lower division comprised largely of quartzite. and of an upper one, mainly of dark slates, has yielded a section of over 25,000 feet of sediments. Cutting the sediments are large batholitic bodies of granite of a later age, possibly late Devonian. Along the axes of folding, within the lower quartzite division, is a widespread system of veins of quartz, often gold-bearing. The Carboniferous strata of the Maritime Provinces within which occur the prolific coal seams of Nova Scotia, are of immense volume. They occur along the western portions of Cape Breton, skirting hills of crystalline pre-Cambrian rocks, or penetrating them along the courses of old pre-Carboniferous bays and valleys. Near the Sydney coal fields of Cape Breton there is a combined section of about 13,000 feet, and along the Nova Scotian shores of the Bay of Fundy, the famous Joggins section has a thickness of above 14,500 feet in which over 70 coal seams are exposed. The Carboniferous sediments in New Brunswick occupy about 10,000 square miles, forming an area triangular in shape, bordering the eastern coast and contracting inland between the two elevated districts of the Province. The Carboniferous and overlying measures extend eastward into Nova Scotia, occupying much of the country north of the Bay of Mines, and reaching into Cape Breton.

In the Eastern Townships of Quebec, the rocks of the pre-Cambrian areas appear to be almost entirely volcanic rocks, chiefly basic varieties. In the Gaspé peninsula, the corresponding rocks include other forms of the nature of granites, as well as acid volcanics and possibly sediments. The same is true in the regions in northern New Brunswick, while in southern New Brunswick and Cape Breton, besides large volumes of granitic and gneissic rocks, variously altered acid and basic volcanics are common, and there also occur masses of crystalline limestone as well as schistose rocks of possibly sedimentary origin. In the northeastern portion of the peinsula of Nova Scotia are considerable districts occupied by greatly disturbed formations probably of Ordovician age, consisting of sediments accompanied by large volumes of igneous rocks, some of which may represent the product's of contemporaneous volcanoes. In New Brunswick, Ordovician beds partly occupy the broken hilly country stretching northeasterly through the province to Chaleur Bay. In this region, the beds of this system consists of shales and sandstones, or their altered equivalents, often penetrated by large bodies of granite and other igneous rocks. Throughout western and northwestern New Brunswick and the Gaspé peninsula generally, large tracts are floored by great volumes of shales, often Calcareous) sandstones, and limestones of Silurian age, now usually highly folded and faulted. With these beds occur many varicties of igneous rocks, some of which represent the products of contemporaneous volcanoes. In Nova Scotia the Silurian strata are largely confined to the northeastern portion of the province, and at one locality on the shores of Northumberland straits there isa nearly complete section of the whole system represented by about 3,000 feet of sediments. Early Devonian calcarious beds occur in Nova Scotia. In southwestern New Brunswick great volumes of argillaceous and arenaceous strata occur. These have also been assigned to the Devonian. The same conditions are duplicated in Nova Scotia, where at one place occur strata containing tuff-like beds indicative of contemporaneous volcanoes.

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Mr. G. B. Wilson is manager of a marble quarry at Marblehead, on the C.P.R. Company's railway line from the head of Kootenay Lake to Trout Lake, B.C.

Mr. J. B. Sword, who has been in Victoria, B.C., during recent months, with associates has again got control of some iron ore claims on Louise Island of the Queen Charlotte group.

Mr. L. B. Reynolds, of Nelson, B.C., is stated by the Daily News to have been ill with typhoid fever at the Hart private hospital, Roxbury, Massachusetts. Mr. Reynolds came East in February, intending to take a trip to Europe. He was at the annual meeting of the Canadian Mining Institute in March.

# CONGRESS GEOLOGIQUE INTERNATIONAL

XIITH. Session, Canada, 1913. Third Circular. Special Notices.

### Third and Last Circular.

This is the last general circular. Any further information will be sent only to members of the Congress.

Copies of the second circular of the Twelfth International Geological Congress can be obtained from the secretary of any geological society, geological survey, mining society, or from the secretary, Twelfth International Geological Congress, Victoria Memorial Museum, Ottawa, Canada.

### Applications to Join Excursions.

Applications to join excursions are being received at a much more rapid rate than was anticipated, therefore, those desiring to join excursions should make no further delay in sending their applications.

### Delegates.

Many delegates appointed by various universities and societies have not yet sent in applications for membership nor for participation in excursions. As applications are being received at a rapid rate, delegates are particularly requested to apply at the earliest possible moment for such reservations as they require.

### Papers and Proposals.

Every endeavour will be made to print in advance of the meeting such contributions as are received up to June 1st. Though every effort will be made to print contributions received after this date, it is not probable that this will be possible. The attention of authors is respectfully drawn to regulations 7a to 7h, page 6, second circular.

### Price of Guide Books.

The price of guide books to persons who are not members of the Congress is seven and one-half dollars for the complete set, the price to members is two and one-half dollars for the complete set. Single guide books will not be sold and only one set at the price of two and one-half dollars will be sold to each member.

### Coal Resources of the World.

The monograph on the coal resources of the world will be published in the form of three (not two as originally intimated) quarto volumes and a folio atlas, the price of which to persons who are not members of the Congress will be twenty-five dollars per set. Members of the Congress have the privilege of buying one set at the price of twenty dollars net provided their orders reach the publishers, Messrs. Morang and Company, Limited, Toronto, or the Secretary of the Congress on or before August 15th, 1913.

### Remittances.

In case it is not convenient to remit by post office money order, drafts drawn on the Royal Bank of Canada in Ottawa, will be accepted Remittances should be payable to the International Geological Congress and for the exact amount in Canadian dollars and cents, at par, at Ottawa. Cheques can not be accepted.

### Payments for Excursions.

The final payments by those participating in excursions should be made in advance of initial date of excursions and as soon as possible after the arrival in Canada of the member or delegate.

### Headquarters During Session at Toronto.

The headquarters will be at the University of Toronto where there will be a branch post office open at all hours and at which registered mail may be received or despatched, money orders sent or cashed, etc. A bank will be established at which money may be exchanged. A typewriting service will be maintained, also a telephone service and messenger service. Railway and steamship agents will also be in attendance.

A restaurant service providing luncheon in the middle of the day will be arranged.

## CHANGES AND ADDITIONS TO EXCURSIONS

**Excursion A.1.**—While at Perce on July 16th, a tablet will be unveiled in memory of the late Sir William Logan, the founder and first director of the Geological Survey of Canada. Sir William Logan's name is familiar to all students of geology, and his interpretation of the structure of the Gaspe peninsula was one of his earliest as well as one of his most remarkable achievements.

**Excursion A.9.**—This excursion starts from Kingston which is at the foot of Lake Ontario and the head of St. Lawrence River, about midway between Montreal and Toronto. Kingston can be reached in a few hours by the Grand Trunk Railway from either Montreal or Toronto or by boat from either place. The combined water and rail route from Montreal as far as Prescott over the Grand Trunk Railway, and from Prescott to Kingston by boat through the Thousand Islands, is especially attractive.

**Excursion C.1.**—It was announced in the Second Circular that a visit would be paid on September 3rd to the Dinosaurian bone beds near Munson but it is probable that this part of the excursion will have to be cancelled because the railway line to this point may not be completed. If, however, any individuals are very desirous of seeing these deposits and if they will so advise the secretary, an endeavour will be made to arrange for a visit to the locality.

**Excursions C.1. and C.2.**—A change will be made in the time table of excursion C.1. so that both excursions C.1 and C.2 may meet in Victoria, British Columbia, on August 26th. In consequence of this change the Sudbury nickel-copper deposits will be visited by excursion C.1 at the end of the excursion instead of at the beginning.

**Excursion C.5.**—Special attention is directed to the character of excursion C.5. The mode of travel by a specially chartered steamer on the Great Lakes, is in itself an attraction. Among the many points of interest may be mentioned, Niagara Falls, the magnificent scenery of the north shore of Lake Huron and the thousands of islands in Georgian Bay. The route traversed presents opportunities for the examination of a Palaeozoic section from the base of the Lowville (Ordovician) to the upper strata of the Devonian. Opportunities will be afforded for collecting fossils in certain localities of world-wide reputation for the profusion of their organic remains. More particularly may be mentioned, Port Colborne, wth its wonderful Onondaga coral reefs; the classic Hamilton localities near

Thedford where nearly 300 species occur; the extremely rich Richmond and Lorraine strata on the shore of Manitoulin island; and the Niagara beds near Manitowaning with an abundance of exquisitely preserved silicified corals.

Students of the pre-Cambrian will be interested in the original Huronian region of the north shore of Lake Huron and in the development of the Grenville series on Parry island.

At Wekwemikong on Grand Manitoulin island a characteristic native "show" is to be given by the Indians. In 1836, by treaty, Grand Manitoulin island was reserved for the various Indian tribes then occupying the islands and adjacent regions of Georgian Bay. The island was to be a haven for all homeless Indians and to-day numerous tribes are represented on Manitoulin.

**Excursion C.8.: Juneau—Yakutat Section.**—This section of the excursion will be under the guidance of Dr. Lawrence Martin, who has spent a number of years making a special study of the region

Five or six days will be devoted to this section of the C.8 excursion and this length of time should be amply sufficient.

Among other points of interest that will be seen and in many cases examined in detail, are: the Fairweather and St. Elias ranges, 4,878 to 5,487 metres high, covered by snowfields and glaciers including the La Perouse and Malaspina glaciers; the front of the great Piedmont ice sheet of Malaspina glacier, the tidal ice front of the Guyot lobe, the forest-covered terminus of the Marvine lobe; the eastern border of Malaspina glacier in Yakutat Bay; the shrub-covered ablation moraine upon Variegated glacier; streams depositing outwash gravels; the calving of icebergs; cirque vacated by a fallen glacier; beaches, sea cliffs, etc., uplifted 2 to 14.4 metres by earthquakes of 1899, fault scarps 1.3 to 2.4 metres high formed by same earthquakes; the Nunatak glacier, hanging valleys, till-veneered outwash gravels, tidal, land-ending and cascading glaciers, etc., in Russell fiord; moraine and glacio-fluvatile phenomena about the terminus of Hidden glacier (advanced 3.2 kilometres between 1906 and 1909); fiord with submerged hanging valleys, submarine moraines, buried forests; strand lines of former glacier lake; Glacier Bay and Muir glacier (receded over 14 kilometres, 1899 to 1911, vertical ablation of about 366 metres).

During the time devoted to this section of the C.8 excursion an opportunity will be afforded of inspecting the Treadwell mine, one of the largest and most important gold mines of the world.

It is possible that the itinerary of C.8 will be changed in so far that the Juneau—Yakutat portion of the excursion may precede the visit to Dawson.

**Special Dates.**

Sunday, July 13, Excursion A.1, Quebec and Maritime Provinces, leaves Montreal.

Wednesday, July 23, Excursion A.3, Sudbury-Cobalt-Porcupine (Ontario), leaves Montreal and Toronto.

Thursday, July 24, Excursion A.2, Haliburton-Bancroft (Ontario), leaves Montreal.

Friday, August 1, special day at Ottawa.

Saturday, August 2, special day at Montreal.

Thursday, August 7, opening day of session at Toronto.

Thursday, August 14, last day of session at Toronto, Excursions C.1 and C.2 start.

Tuesday, August 26, special day at Victoria, B.C.

# RAILWAY PRIVILEGES IN CANADA

**Special Arrangements for Professional Members.**

Professional members are defined as members of the Congress who are geologists, mining engineers, geographers and others engaged in the study or application of some branch of geology, (regulation 8a, Second Circular, page 7).

To professional members of the Congress and to dependent members of their families, a special form of certificate will be given. The possession of this certificate will enable the person to whom it is issued to purchase and use during a limited period of time railway tickets at a much reduced cost, to and from any point in Canada at the following rates and under the following conditions.

1. One way (or single tickets) at one-half the lowest one way first class fare.

2. Round trip (or return tickets) at lowest one way first class fare provided the same route is followed going and returning.

3. Circuit tours (or tours in which various points on different railways are visited) at one-half the lowest one way first class fare from point to point via route traversed.

4. Exceptions. There are a few small, privately owned railways and a few steamboat connections to which this plan does not apply but it is not considered necessary to detail them here. Particulars on application.

5. Dates of sale and limits of time of travel. Tickets may be used from June 15th to October 31st, 1913. Tickets cannot be used or purchased after October 31.

6. Stop overs (i.e., permission to break the journey and stay at any place on the route) will be allowed on application to conductor of train or purser of steamboat. It is necessary to make such application before getting off train or steamboat.

The certificate will be sent to the member's home address. If, however, applications for membership are received too late, the certificates can be obtained from the Secretary of the Congress who will meet the members on their arrival at Montreal before excursions A1, A2, and A3 start, or if they arrive at Vancouver or Victoria, certificates can be obtained from the passenger agents of the Canadian Pacific Railway at either of these places.

**Special Arrangements for Non-professional Members.**

A reduction of single fare plus 25 cents on certificate plan will be granted to all persons travelling directly to and from the sessional meeting at Toronto. Persons attending should purchase one-way first-class full fare tickets (fare for which must not be less than 50 cents) to place of meeting, and secure a certificate to that effect on the standard certificate form.

These certificates must be validated at the meeting and should be presented for that purpose at the secretary's office, University of Toronto, not later than August 12th.

A special agent of the transportation companies will attend the meeting on August 8, 9, 11 and 12, for the purpose of validating the certificates and at that time will collect the 25 cents referred to above. Certificates may then be exchanged for tickets for the return journey without further charge.

Certificates issued at points in Canada, Fort William, Ontario, and east, in connection with tickets good going August 3 to 9, inclusive, will be honoured for tickets for the return journey until October 31, 1913.

Certificates issued at points in Canada west of Fort William, Ontario, in Ontario, Manitoba, Saskatchewan, and Alberta, in connection with tickets good going July 31 to August 5 inclusive, will be honoured for tickets for the return trip until October 31, 1913.

Further information may be obtained from any ticket agent in Canada or from the secretary.

## RAILWAY PRIVILEGES IN UNITED STATES

**Special Rates to Members Attending Congress from Certain Points on Pacific Coast in the United States.**

Tickets from certain points in California to Toronto and return, may be purchased on certain dates at a reduced rate of $95.70. Such tickets are valid for transportation eastbound for fifteen days from date of sale and are valid for transportation westbound for three months from date of sale, but not beyond October 31, 1913.

Similar tickets will be sold daily from May 28th to September 30th inclusive, at reduced rate of $92.00 from certain points in Washington and Oregon; tickets from this territory will also be valid for transportation eastbound for fifteen days from date of sale, and for return trip not later than October 31st, 1913.

Regular nine months tourist tickets, approximating about one fare and one third for the round trip, are in effect daily from certain points in the States of California, Nevada, Oregon and Washington to Toronto and other Eastern points.

Further information regarding dates of sale, etc., may be obtained from local ticket agents in States named.

# LUCKY JIM ZINC MINES, LIMITED

Prior to holding the annual meeting of the Lucky Jim Zinc Mines, Limited, at Kaslo, B.C., on May 1st, the directors issued to the shareholders the following statement of the operations of the company since the last annual meeting:

The operations at the mine, which were being carried on by way of development work in the lower levels, were continued and preparations were made for shipping clean ore as soon as transportation facilities, being provided by the Canadian Pacific Railway Co., were ready. The railway was completed to the mine about August 1st. Prior to that date orebins were constructed at the mine, for shipping purposes, these bins having a capacity of about 150 tons. An aerial tramway, about 600 feet in length, was also constructed, to convey the ore from the portal of No. 5 tunnel to the loading bin above the railway track.

A body of shipping ore of considerable size had been developed in No. 5 tunnel, so, as soon as the railway became available, ore was stoped from between Nos. 5 and 4 levels, and shipment was begun. During the months of August, September, October, and November, about 1,850 tons of ore was stoped and shipped to the smeltery at Depue, Illinois. This practically exhausted the shipping ore from that stope. During the time that stoping was being done, development work was continued in No. 6 level on a likely-looking vein that had been discovered earlier in the year. A small amount of shipping ore was obtained from this vein, but the larger portion of the ore was unsuitable for shipping without concentration.

It has become evident to our engineer and mining superintendent that the vein discovered in No. 6 level is a continuation of the orebody stoped in No. 5 level, and development work has since been done to prove that this is so. While results have been satisfactory, no large body of shipping ore has been opened by this work.

In December, seven or eight more cars of ore was mined and shipped and then heavy snowslides occurred and completely tied up the transportation facilities. The railway company was unable to get the track clear of snow before the middle of March, since which time ore-shipping has been resumed. Present prospects are that the company will be able to mine and ship seven to ten cars of shipping ore per month.

The quantity of ore shipped between August 1 and March 31 was 2,090 tons, gross, and the gross receipts from the smeltery on account of this ore were $77,537. The freight paid thereon was $22,608, and the duty $19,185; together $41,793. This left $35,744 as the amount of net cash received from the sale of 2,090 tons of ore. The figures are subject to slight adjustments in regard to freight and duty, but the difference one way or another will be but small. The average net value of the ore was $17 a ton, which is a high average.

The proceeds received have been applied partly to pay a claim of the smeltery company against this company of about $17,000, which amount, after having been owing more than two years the smeltery company required to be paid. The remainder of the money was used in paying wages and for supplies. On account of there having had to be handled a large quantity of concentrating ore and waste material, receipts were insufficient to pay for all the requirements of the mining done.

Your directors have been obliged to sell part of the treasury stock, in order to raise money to carry on mining operations and to meet other requirements. The company still has available for sale about 150,000 shares of treasury stock, of this the Canadian Pacific Railway Co. holds 100,000 shares as security for a contract made with that company by the former management of the Lucky Jim Co., for the shipping of ore to the smeltery over the railway company's lines.

Your directors found in existence a smelting contract with the Empire Zinc Co., of Denver, Colorado, which so far it has seemed desirable to maintain. During the past year the smeltery company has given every satisfaction by the manner in which it has handled the Lucky Jim ore.

At the present time there is not available in the mine any large body of shipping ore developed. There is, though, some 50,000 tons of concentrating ore, but it will not be possible to realize on this until after a mill shall have been provided for concentrating it. There is not available in British Columbia a suitable custom mill to which the company could send its concentrating ore, so it will be necessary to build one. Our mine superintendent's estimate of the value of the above-mentioned concentrating ore is $214,000 net, that is, after payment of all costs of mining, concentrating, freight and duty. The cost of a concentrating mill with a capacity of about 100 tons a day would be about $80,000, which sum would also include the cost of providing the additional power necessary to operate the mill.

The concentrating ore mentioned is partly broken down in the mine, so the quantity can be estimated with near approach to certainty. In addition, there is reasonable expectation of a much larger amount of concentrating material being developed in the future.

It is evident that, by some means, a concentrating mill must be provided at the earliest possible time, in order to secure the profitable operation of the mine. The means to be adopted for its provision is one of the important questions to be considered by the shareholders.

During the past winter the directors found it necessary to instal a steam plant to operate the compressor and electric light plant for the property. This was done at a cost of about $4,000, and the plant is working satisfactorily. With the opening of spring, the water supply will again be available so that, with the steam power as well, the company will have ample power for all purposes required until a concentrator shall be put in.

The directors invite the co-operation of shareholders in connection with the further development of the property. They are of opinion that, with a concentrator built at or near the mine, the operation of the property will result very profitably, and that with sufficient development much larger quantities of ore will be found. They are informed that the quality of the ore in the Lucky Jim mine is unique in America, as regards both clean and concentrating ore. With a concentrator provided, they look for a bright future for the property.

## OBITUARY

A few weeks ago the death occurred in British Columbia of Mr. Francis J. Deane, a man who several years ago was most energetic and successful in the publication of mining news of British Columbia. While he had for many years previously been engaged in newspaper work, in the Coast cities of the province and afterwards as publisher and editor of the Kamloops "Inland Sentinel," it was in connection with his valuable work of establishing the Nelson "Daily News" and bringing it up to the position of a newspaper of high character and wide circulation that he was best known throughout the important mining districts of Kootenay and Boundary. He made for the "Daily News" an excellent reputation for the mining news printed in it. He developed the weekly statistical column, showing the ore production of the two most important producing districts in British Columbia, and during the years in which as proprietor and editor he directed that newspaper, accuracy was his first aim, and it was seldom, if ever, the "boomer" of the objectionable and untruthful kind managed to make use of the columns of his newspaper. It was Mr. Deane, too, who first suggested to Mr. E. Jacobs the idea of an annual mining review for a special New Year edition of the "Daily News," and arranged with that mining writer to supply the requisite data for that widely-read review.

Apart from the particular work above outlined and the markedly good service thereby rendered to the mining industry of the province, Mr. Deane was highly esteemed. Mr. Fred C. Moffatt, barrister, of Nelson, long Mr. Deane's right-hand man in the editorial department of the "Daily News," lately contributed to that newspaper the following appreciative tribute to his deceased friend:

"Mr. Deane was of a reticent disposition, but no one who knew him at all intimately could fail to admire and respect him. The man who met him in the ordinary course of business, perhaps, never appreciated the sterling qualities which underlay his retiring manner, but all who had the advantage of close association with him liked him. He had the faculty of so attaching to himself the affection of the members of his staff that there were few who would not have gone to great personal inconvenience to serve him. I think that this was shown by the manner in which 'The Daily News' came through the ordeal in the early years of this century when this country, sparsely populated and suffering from a period of depression, made it necessary for herculean efforts to keep the paper going; to Mr. Deane's splendid personal qualities which caused his staff to put their best efforts into their work on account of their strong personal attachment for him must be attributed largely the fact that the paper was carried hrough the bad times."

# THE TRANSMISSION OF POWER BY COTTON ROPES

*By E. EDWARD HART, M.A.*

A Paper Read Before the Association of Engineers-in-Charge

(Continued from issue of May 15)

(a) In Vol. CXVI of the Minutes of the Proceedings of the Society of Civil Engineers, some tests made by Mons. Fauguier show that belts are 2 per cent. better than ropes. But he used ropes 1 9-16-in. diameter on a pulley 2 ft. 10¼-in. diameter, and ran them at the excessive speed of 5,376 ft. per minute, and could not, therefore, expect to get good results from the ropes.

(b) In the well-known experiments made at Lille in 1894, Manilla ropes 1¾-in. diameter were tested against belts, and at a speed of 4,000 feet per minute it was found that there was less slip with the ropes than with the belts, but that the difference between the efficiency of belt and rope-gearing was inappreciable. Unfortunately, these tests were not as complete as they might have been.

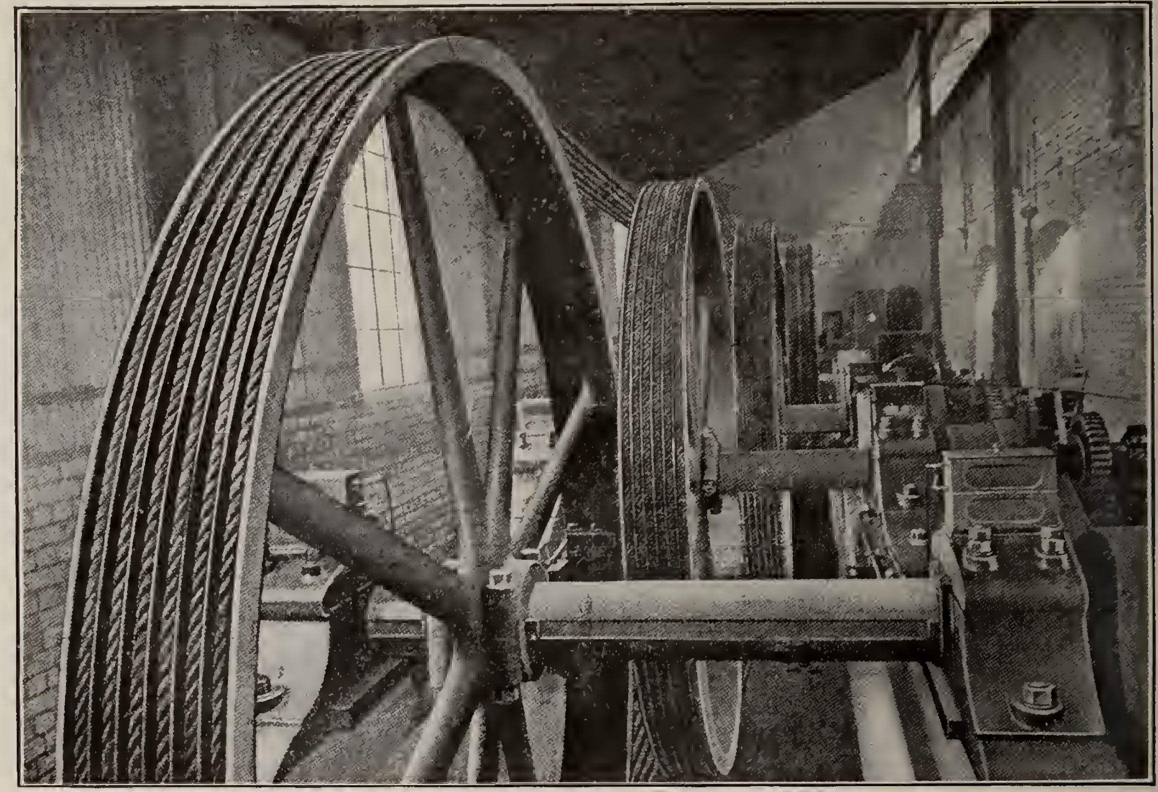
(c) In a more recent test of a 150 h.p. motor, running at 900 revolutions per minute driving spinning frames, the total electrical power developed by the motor was

119 h.p. during the period of the test. This was found to be expended as follows:

| | |
|---|---|
| In motor | $12\frac{1}{2}$ h.p. |
| In main driving ropes | $1\frac{1}{2}$ h.p. |
| In net shaft friction | 6 h.p. |
| In belts to machines | 7 h.p. |
| In machines | 92 h.p. |

In these three instances, the ropes used were not all made of cotton, though probably they were so in the first and last cases mentioned.

(d) A series of experiments was undertaken a few years ago by Prof. Ewing to ascertain what loss occurs in the transmission of power by ropes through the work which is expended upon the rope itself. The work is spent partly in bending and unbending it, and partly on getting it into and out of the grooves of the pulleys on which the rope runs. The ropes tested were the resistance of pulleys, and the imperfect elasticity of the band driving the system from the motor. These values were deducted from those observed when the rope was in action. A series of values of R (the resistance in lbs.) and S (the static tension in the rope) was taken for both diameters of rope on both sets of pulleys. And it was found that when these values were plotted out on squared paper the values of R in relation to S at any one speed were represented by a straight line. The experiments showed that R increases with the speed, by amounts which are proportional to the increase of speed (within the limits tested). Hence it is easy to infer the values of R for higher speeds if we assume the same law to hold good. It was noticed, too, that of the whole work expended on the rope, a large part depended on the tension. This indicates that the work of jamming the rope into the groove and pulling it out again is relatively large, and that this



**View of a Heavy Service Drive**

Lambeth Cotton ropes, four-strand, of 1-in. and $1\frac{1}{4}$-in. diameters, and they were both run on pairs of 2 ft. 6 in. and 3 ft. 6 in. diameter pulleys. One pulley was slung vertically under the other in a lever frame, so that any desired tension might be set up in the ropes by adding weights to the lever arm. The system was driven by an electric motor set on a cradle dynamometer through a fine endless band, and the resistance R due to the jamming of the rope in and out of the grooves, and also that due to the bending and unbending of the rope, was measured by the weights required to be applied to a lever arm on the cradle dynamometer to prevent it from tilting. A fine and very flexible cord was first substituted for the rope, and a preliminary series of experiments made under various speeds and loads. The readings obtained corresponded to that part of the resistance due to axle friction, air constitutes an important source of loss of power in driving by ropes. The results showed that at any given speed and for any given pair of pulleys, R increases at a uniform rate when the tension is increased. The resistance is made up of two terms, a constant (independent of the tension) and a term proportional to the tension. So that a formula $R = a + b S$ is applicable to all cases (a and b being constants). Further, a and b depend upon the speed, and they both increase in a uniform manner with increase of speed. Further, both a and b are greater for the thicker ropes on the same pulley. They are also greater for the smaller pair of pulleys, when the same rope is tested on pulleys of different diameters.

For a 1-in. diameter rope on a pair of pulleys 3 ft. 6 in. in diameter, at a speed of 4,950 ft. per minute, $R = 0.57 + .0101 S$.

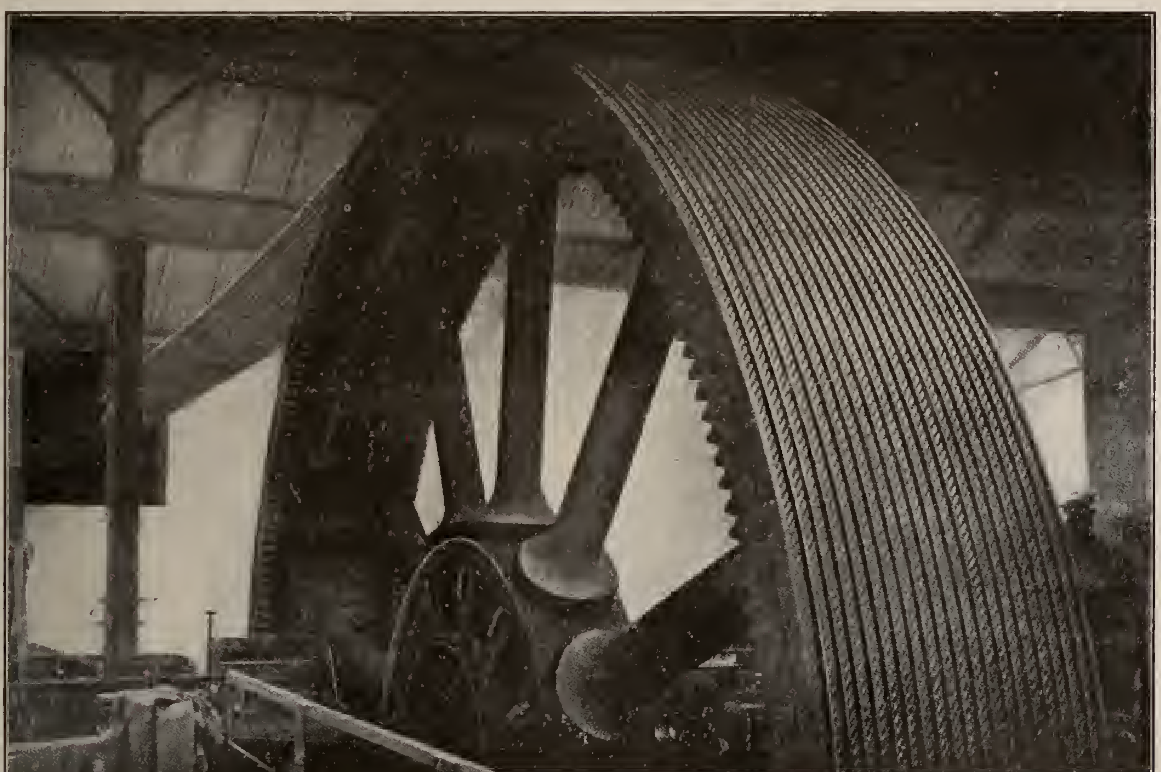
For a 1¼-in. diameter rope under the same conditions as to speed and pulleys, $R = 1.16 + .0112\ S$.

In applying these formulae to practical cases in which the tension is different on the two sides of the rope, Prof. Ewin says, "It appears proper to take S as the greater of the two tensions, for this determines the extent to which jamming of the rope into the groove will take place."

To find the actual percentage of power lost on any given drive. Take, for example, this 1-in. diameter rope running at 4,950 ft. per minute on a pair of pulleys 3 ft. 6 in. in diameter with a static tension S of 100 lbs. Then $R = .57 \times .0101 \times 100 = 1.58$ lbs.

To find the gross tension in the rope, we must add the centrifugal tension set up in it at this speed to the static tension, which in this case equals 59 lbs., so that the gross tension would be about 159 lbs. Prof. Ewing goes on to say: "From such data as I have been able to obtain, it appears that a 1-in. diameter rope, under these conditions, will generally transmit an effective driving force of about 70 lbs., corresponding to 10.7 h.p. Hence, the percentage of power lost is $\frac{1.58 \times 100,}{70}$ or 2¼ per cent." A similar calculation shows that a -¼-in. diameter rope, under exactly the same conditions as above, loses about 2¾ per cent. of the power transmitted. These results agree reasonably closely with the empirical formula of Prof. J. J. Flather, of Purdue University, for losses due to bending in hemp ropes, which embodies the ideas of Eytelwein and Reulaux on the same subject, viz., that $R = \frac{34}{100} P$, provided that the diameter of the smallest pulley is not less than 30d. For a 1-in. diameter rope, this gives R = 3 per cent. of the driving force.

It will be seen from these results that, provided the pulleys are of reasonable diameter, and the rope is properly constructed, there is no need to take into account any losses of power due to the rope itself. But if, on the contrary, ropes are set to work around very small pulleys in relation to their diameters, or made to work out of their natural position by means of guide pulleys, or turned round corners, or compelled to make reverse bends, the loss of power is very great. The use of small pulleys is in most cases influenced by the velocity ratios required; but it should always be borne in mind that, besides the power lost in each rope by the reduction of the arc of contact on the small pulley, there is also a large percentage of power lost by bending the rope round such a small arc. How severe this bending is may often be seen by the comparison of the interior of a rope that has been working sometimes for only a few hours round a small pulley, with one that has worked for years on a properly-designed drive. Whilst the yarn in the latter is as good as on the day it was put in, the inner strands of the former are broken up into short pieces, cut clean in two as if with a knife. By altering the turns or construction of the rope, it is often possible to considerably improve the life of a rope on such a drive; yet when all has been done that can be done, the state of the rope when it is taken off clearly shows how great an amount of power has been wasted, i.e., expended in destroying the rope, instead of being transmitted to the driven pulley. In many instances, of course, there are insuperable difficulties in the way of a good drive, and the ropemaker has to do his best by careful fitting of the grooves, trying different types of rope, etc., to make the drive a success. But frequently, by a little forethought and "judicious dodging," the engineer-in-charge may change a very awkward drive into a very passable one.



**A Drive Showing Twenty Single Strands.**

### Ideals of a Rope Drive.

Though not always attainable, the following conditions should be aimed at by any one desirous of a satisfactory rope installation. Let the pulleys be not less than 30 times the diameter of the rope used, let them be equal in diameter if possible, and as large in diameter as may be, their ratio not to be greater than 5 to 1. Aim at having a distance of not less than 25 ft. between the pulley faces, and the drive horizontal, with the slack on the top side. Speed to be from 2,000 to 4,000 ft. per minute. Give about 4 to 6 ft. clearance under both sides of the rope, taking great care that the ropes have no chance of rubbing against anything. Allow 2 or 3 inches clearance between the bearing foundations and the sides of the pulleys, so as to leave the rope splicer room to get the ropes on without damaging them. See that the pulleys are in line, true, concentric, and balanced, that their grooves are all exactly alike, and that the ropes are of the same diameter. Do not overload the drive, and see that the engine runs steadily, and that the load is an even one. Avoid where possible, the introduction of gear wheels between the prime mover and a rope drive. Do not let the ropes get wet, let them be properly lubricated, and do not have them too light. Put all the ropes on at one possible after they are fixed. Get an experienced rope time, and pull full load on them as soon as reasonably splicer to splice and fix the ropes, and avoid the use of carrier pulleys, rollers, and angular drives as much as possible. Speaking generally, it is possible to comply with all, or nearly all, of these conditions. And where this is the case, the mill engineer often forgets, for many years, all about his ropes, as they give him no trouble. There are drives, however, which present difficulties to those who have to deal with them, and although I do not wish to unduly emphasize them, as they are of comparatively rare occurrence, yet a few hints as to their solution may not be out of place.

(To be continued.)

# GRAPHITE

By Edson S. Bastin.

(Advance Chapter from Mineral Resources of the U.S.)

### INTRODUCTION.

The origin, properties and uses of graphite were fully discussed in the report on the production of graphite in 1911. As copies of that report may be had on application, this information will not be repeated here. The 1911 report contained also a summary of existing knowledge in regard to the graphite deposits of the island of Ceylon and an index and bibliography of the more important publications dealing with the character, uses and origin of graphite and its occurrence in the United States.

A considerable quantity of material is produced in Bartow County, Ga., which cannot properly be classed as graphite, but is rather a slate carrying from 2 to 15 per cent. of carbon, probably in part graphite. It is ground for use as a filler and drier in fertilizers. In 1909 the production of this material was included in the statistics under the heading "Amorphous graphite," but as it is not adapted for any of the purposes for which higher grades of amorphous graphite are used and as these higher grades are never used as fertilizer filler, it is deemed best not to include this material under the name graphite.

The bulk of the graphite consumed in this country continues to be derived from foreign deposits. In 1912 the quantity of graphite imported into the United States for consumption was 25,643 short tons, valued at $1,709,337. In contrast to this the total domestic production was 2,445 short tons of natural graphite, valued at $207,033, and 6,448 short tons of manufactured graphite, valued at $830,193.

### PRODUCTION AND IMPORTS. NATURAL GRAPHITE.

#### Production.

In 1912, as in 1911, the total production of crystalline graphite came from Alabama, New York and Pennsylvania. All of this crystalline graphite was of the variety known in the trade as "flake" graphite that occurs as small flakes disseminated, through crystalline schists, from which it is separted by more or less complicated milling processes. The production of crystalline graphite in the United States has decreased continuously since 1909 as is shown in the accompanying table. This decrease resulted mainly from the closing of numerous graphite properties, very few new properties having begun operation during the same period. The destruction by fire of the mill of the Allen Graphite Co., at Quenelda, Ala., was the cause of a part of the decrease in 1912.

Amorphous graphite was produced during the year by three firms, located in Michigan, Nevada and Wisconsin. The Michigan product is a slate carrying 25 to 30 per cent. of graphite and is all consumed by one firm in the manufacture of paints. The Nevada and Wisconsin products were very small. All the firms reported decreased production as compared with 1911.

Further details in regard to various properties are given in the summary by States and Territories.

**Production of Natural Graphite, 1908-1912.**

| Years. | Amphorous. Quantity. Short tons. | Amphorous. Value. | Crystalline. Quantity. Pounds. | Crystalline. Value. | Total. Quantity. Short tons. | Total. Value. |
|---|---|---|---|---|---|---|
| 1908 | 1,443 | $75,250 | 2,288,000 | $132,840 | 2,587 | $208,090 |
| 1909 | *5,096 | 32,238 | 6,294,400 | 313,271 | 8,243 | 345,509 |
| 1910 | 1,407 | 39,710 | 5,590,592 | 295,733 | 4,202 | 335,443 |
| 1911 | 1,223 | 32,415 | 4,790,000 | 256,050 | 3,618 | 288,465 |
| 1912 | 673 | 19,344 | 3,543,771 | 187,689 | 2,445 | 207,033 |

*Includes Georgia graphitic slate.

On account of the small number of producers, figures of production by States cannot be published without revealing individual productions.

### Imports.

In 1912 there was a slight increase in the quantity of graphite imported from each of the four countries, Ceylon, Mexico, Canada and Chosen (Korea) (via Japan). The total value of the graphite imported was $1,709,337, as compared with a total value of $1.037,226 for the domestic product, both natural and artificial.

The imports of graphite into the United States in 1911 and 1912 by countries are shown in the following table:

**Imports of Graphite for Consumption into the United States, 1912, by Countries, in Short Tons.**

| Country. | Quantity. | Value. |
|---|---|---|
| Ceylon | 16,791 | $1,379,587 |
| Mexico | 3,518 | 163,107 |
| Canada | 2,688 | 122,216 |
| Japan (Chosen via Japan) | 1,574 | 22,875 |
| Austria-Hungary | 473 | 8,971 |
| Italy | 468 | 7,450 |
| Germany | 102 | 2,669 |
| Other countries | 29 | 2,462 |
| Total | 25,643 | $1,709,337 |

The following table shows the imports for consumption of graphite from 1908 to 1912, inclusive:

**Imports for Consumption of Graphite Into the United States 1908-1912 in Short Tons.**

| Years. | Quantity. | Value. |
|---|---|---|
| 1908 | 11,456 | $ 762,367 |
| 1909 | 21,367 | 1,854,459 |
| 1910 | 25,235 | 1,872,592 |
| 1911 | 20,702 | 1,495,729 |
| 1912 | 25,643 | 1,709,337 |

As Ceylon continued to furnish most of the graphite consumed in this country, the following table is given to show the distribution of the Ceylon product. From the early days of the industry up to 1901, Great Britain consumed more Ceylon graphite than any other country. In 1901 the United States assumed the first place, with Great Britain second until 1909, when Germany took second place. The distribution of graphite exports from Ceylon for one year in each of these trade periods is given below:

**Exports of Graphite from Ceylon in Short Tons.**

| Destination | 1885* | 1902 | 1912† |
|---|---|---|---|
| Great Britain | 7,670 | 7,586 | 5,348 |
| United States | 3,074 | 15,244 | 15,460 |
| Germany | 67 | 3,833 | 8,057 |
| Belgium | .... | 1,096 | 2,874 |
| Other countries | 187 | 453 | 824 |
| Total | 10,998 | 28,212 | 32,563 |

*Figures from Ceylon Government Blue Book.

†Advance figures issued by the Ceylon Chamber of Commerce.

Some importations of flake graphite were received from Canada and of amorphous graphite from Mexico and from Chosen (Korea). As practically all of the Korean output is shipped via Japanese ports, it is reported in the custom house returns as coming from Japan, but so far as can be learned little or no graphite is produced for exportation in Japan proper. The Ceylon deposits and industry were described at some length and the Korean deposits were briefly referred to in the report on the production of graphite in 1911.

Some small shipments of graphite from Madagascar are reported to have been received in this country during the year and some larger shipments are now on their way. The following information in regard to the graphite industry of Madagascar is taken from a report† by James G. Carter, United States Consul at Tamatave:

**Exports of graphite from Madagascar, 1909-1912.**

| | Quantity. Metric tons. | Value. |
|---|---|---|
| 1909 | 200 | $14,320 |
| 1910 | 554 | 55,713 |
| 1911 | 1,281 | 86,188 |
| 1912 (first half) | 1,121 | 60,246 |

†Dail Cons. and Trade Repts. Jan. 29, 1913, pp. 516-517.

### WORLD'S PRODUCTION.

The world's production of graphite for the year 1910 was as follows:

**World's Production of Graphite, 1910, in Short Tons.***

| Country. | Quantity. | Value. |
|---|---|---|
| United States | 4,202 | $335,443 |
| Canada | 1,392 | 74,083 |
| Mexico | 2,571 | 36,207 |
| Russia | .... | ...... |
| Germany | 8,174 | 76,404 |
| Austria | 36,520 | 281,220 |
| Norway | 882 | 8,575 |
| Sweden | 1,526 | 1,844 |
| France | 606 | 5,353 |
| Italy | 13,790 | 74,808 |
| Japan | 162 | 5,202 |
| Chosen (Korea) | .... | 56,719 |
| India | 4,761 | 99,661 |
| Queensland | .... | ...... |
| Ceylon | 35,310 | 2,577,600 |
| Madagascar | 601 | 21,218 |
| South Africa | 40 | 6,755 |

*Mines and quarries: General Report with Statistics, pt. 4. London.

### MANUFACTURED GRAPHITE.

The following table shows the production of manufactured graphite by the International Acheson Graphite Co., at Niagara Falls, N.Y., for the years 1908-1912, inclusive:

**Production and Value of Manufactured Graphite, 1908-1912.**

| Years. | Quantity. Pounds. | Value. | Average price per pound. Cents. |
|---|---|---|---|
| 1908 | 7,385,511 | $502,667 | 6.80 |
| 1909 | 6,664,017 | 480,000 | 7.20 |
| 1910 | 13,149,100 | 945,000 | 7.20 |
| 1911 | 10,144,000 | 664,000 | 6.55 |
| 1912 | 12,896,347 | 830,193 | 6.44 |

### INDUSTRY BY STATES AND TERRITORIES.

**Alabama.**—The plant of the Quenelda Graphite Co. (formerly the Allen Graphite Co.), at Quenelda, was destroyed by fire, but is now being rebuilt with a capacity for handling 400 tons of crude material in 10 hours. No production was reported for 1912.

The Ashland Graphite Co.'s plant, about 4½ miles west of Ashland, was idle during 1912. Some of the persons interested in this company are engaged, under the name of the Alabama Graphite Co., in developing a graphite deposit of similar character in the near vicinity. A mill was erected and began operations in August, 1912.

Alaska.—During the year the Uncle Sam Alaska Mining Syndicate opened a new property in the Kigluaik Mountains, Port Clarence mining district. According to a description obtained through the courtesy of the manager of this company the property comprises nine locations of claims and two mill site locations nearly two miles (10,168 feet) south of Graphite Bay, a branch of the Imuruk Basin. The elevation is about 500 feet above sea level. The graphite occurs associated with schists and gneisses which strike east and west and have steep dips. The richer graphite portions can, it is claimed, be readily separated by hand sorting. Some graphite has been shipped to Everett, Wash., where a small mill is being erected for its treatment.

At the property of the Alaska Graphite Co., also in the Port Clarence district, development work was in progress during the latter part of 1912, but no graphite was shipped.

**California.**—A company known as the California Graphite Co. was incorporated in January, 1913, to develop a graphite deposit near Saugus, in Los Angeles County. The material is similar in general to some of the graphitic schists of the eastern United States and it is planned to erect a mill at an early date.

**Colorado.**—Some development work was in progress during 1912 on a new graphite property near the summit of Italian Mountains, in Gunnison County, Colo. The deposits are near the head of Cement Creek and are about 10 miles from the railroad. A company formed for their development is known as the Colorado Graphite Mining and Manufacturing Co. with office in Denver. According to a private report made to this company by S. C. Robinson, mining engineer, there appear to be three parallel "veins" of graphite about 50 feet apart, lying parallel to the inclosing beds of stratified rock, which here stands nearly vertical. The middle "vein" is the largest and has a width of 4 to 6 feet. All development has thus far consisted in open-cut mining. This locality lies either within or just east of the area covered by the Anthracite-Crested Butte folio (No. 9) of the Geologic Atlas of the United States. Within this area coal occurs in the Cretaceous formations. Though normally bituminous, it has locally been altered to anthracite as a result of dynamic metamorphism or of the proximity if igneous rocks. The occurrence of graphite as a result of still more intense alteration is therefore not at all surprising.

The mine of the Federal Graphite Co., near Turret, in Chaffee County, was idle in 1912.

**Idaho.**—Graphitic schists are known to occur on Salmon River, near Grangeville, Idaho, and analysis of a specimen showed 7.6 per cent. of fixed carbon.

**Massachusetts.**—Graphite has not been produced in Massachusetts for some years. Mr. F. C. Husbands states that at the famous Sturbridge mine (described in the report on the production of graphite in 1911) the main lode has been prospected for over half a mile west from the shore of Lead Mine Pond, for most of this distance to a depth of 50 to 60 feet. One lump, mostly graphite, taken out about 1904 weighed about 510 pounds.

**Michigan.**—In Michigan the Detroit Graphite Co., whose mine is near L'Anse, Bargara County, was the only producer. The material is a graphitic slate, which is ground for paint pigment.

**Montana.**—At the property of the Crystal Graphite Co., near Dillon, Mont., development work was continued during 1912 at the tunnel workings, a new drift being driven on one of the veins and a winze sunk.

**Nevada.**—The Black Lead Mining Co. continued operations at Carson, Nev., its product being ground, but not refined, and sold for paint pigment and as foundry facings.

Mr. E. Edwin, of Ludwig, Lyon County, reports the discovery of a graphite deposit in that county. He states that the graphite deposit is between 4 and 5 feet thick and is traceable on the surface for several hundred feet. A specimen sent to the Survey was an amorphous graphite of good quality.

**New Mexico.**—A large body of amorphous graphite occuring in the canyon of Canadian River about seven miles southwest of Raton, in Colfax County, has been described by W. T. Lee.* This graphite has been formed by the metamorphism of coal through the effect of igneous rocks intruded into it.

**New York.**—In New York the firms operating were the American Graphite Co. (Joseph Dixon Crucible Co.), at Graphite, Warren County; the Empire Graphite Co., at Greenfield, Saratoga County; the Sacandaga Graphite Co., at Conklingville, Saratoga County, and the International Acheson Graphite Co., at Niagara Falls. The Macomb Graphite Co., at Pope's Mills, St. Lawrence County, was idle in 1912, and the Crown Point Graphite Co., at Crown Point, Essex County, has been idle since the fall of 1910.

**North Carolina.**—A few tons of graphitic schist were mined at Barretts Mountain, in Alexander County, but none was refined or shipped.

**Pennsylvania.**—The only firms operating in Pennsylvania during the year were Pettinos Bros., at Byers, and the Rock Graphite Mining and Manufacturing Co., at Chester Springs. The Eynon Graphite Co., with mine and mill near Coventryville, which took over the property of the Imperial Graphite Co., continued experimental and development work.

**Wisconsin.**—The Wisconsin Graphite Co., at Stevens Point, in Portage County, reported a small production. The material is a graphitic slate and is ground for use mainly as a paint pigment.

## MARKETS AND PRICES.

The prices paid by crucible makers and others for Ceylon graphite during 1912 were approximately as follows:

**Prices of Ceylon Graphite at New York City in 1912.**

| | Cents per pound. | |
|---|---|---|
| Ordinary lump: | | |
| Best | 8¼ to | 10 |
| Medium | 7 | 8 |
| Poor | 5½ | 7 |
| Dust: | | |
| Best | 3 | 3½ |
| Medium | 2½ | 2¾ |
| Poor | 1⅞ | 2⅛ |
| Chip: | | |
| Best | 5¼ | 7 |
| Medium | 4½ | 6 |
| Poor | 3½ | 4½ |
| Flying dust: | | |
| Best | 2 | 2¼ |
| Medium | 1¾ | 2 |
| Poor | 1¼ | 1½ |

In general the range in prices was somewhat greater than in 1911, and during the last half of 1912 there was a notable advance in prices.

* Lee, W. T., Graphite near Raton, N. Mex.; Bull. U.S. Geol. Survey No. 530-L, 1912.

The average price of Korean graphite during the year was about $25 a short ton, c.i.f. New York City. Most of this material is used for stove polish and foundry facings.

Most of the domestic producers of graphite who were operating during the year reported that market conditions were good. The prices for American flake graphite were very variable, but the following table will give some idea of their general range.

**Prices of Domestic Flake Graphite in 1912, f.o.b. mills.**

| | Cents per pound. | |
|---|---|---|
| Best crucible flake | 5½ to | 7½ |
| Medium grade flake | 4 | 6½ |
| Inferior grade flake | 2½ | 4 |
| Dust | ¾ | 3 |

In general the prices appear to be slightly higher than in 1911.

# PERSONAL AND GENERAL

Mr. William Watson, recently returned to British Columbia from New York.

Mr. G. M. Colvocoresses has spent some time in the Sudbury district, aid in the country to the north.

Mr. Kirby Thomas, of New York, was in Toronto about the middle of May.

Mr. A. B. Willmott, of Toronto, has accepted an important consulting position with the Lake Superior Corporation. He will still maintain his office in Toronto.

Mr. Clifford E. Smith, mining engineer, Toronto, recently visited Cobalt and Gowganda.

Mr. C. B. Burchell, formerly manager of the Maritime Coal, Heat and Power Co., Nova Scotia, has accepted a special commission to make certain professional examinations in Europe. Mr. Burchell will be absent for six months.

The Roberts & Shaefer Company, coal machinery engineers and contractors, Chicago, have added to their firm Mr. Willis E. Holloway and Mr. Paul W. Holstein. Both these gentlemen have had extensive experience in designing and installing coal handling equipment and conveying machinery.

Mr. Geo. Watkin Evans, consulting coal mining engineer, Seattle, has been selected to make an examination as to the commercial possibilities of the Matanuska coal fields of Alaska for the United States Bureau of Mines. Mr. Evans left Seattle on May 18th.

Mr. Erich Meurer, mining engineer, of Cologne, Germany, is in Canada looking into the market for Cobalt ores.

Mr. Chas. A. Banks, manager for the Jewel Syndicate, has returned to the Jewel mine, in Boundary district of British Columbia, from a visit to England, where he conferred with his directors relative to the future operations of the syndicate's mine and 15-stamp mill.

Mr. W. F. Best, of Victoria, B.C., is spending the field season in Strathcona Park, a little-known mountainous part of Vancouver Island, in which it is thought probable valuable metalliferous deposits may be found.

Mr. J. W. Brewer has been examining mining property in the Coast district of British Columbia, to report on it for the owners.

Dr. D. D. Cairnes is expected, according to a report published in Vancouver, to visit Silver Creek and vicinity, in Atlin mining division, to ascertain what are the prospects for the opening there of a payable placer gold field.

The Edmonton Bulletin has printed the following among its news items: Hr. Howard D. Cameron, M.E., C.E., formerly superintendent of the War Eagle mine at Rossland, B.C., is back in Edmonton after an extended trip into the Pembina coal fields country, Alberta.

Mr. Chas. Camsell, of the Geological Survey of Canada, during the ensuing field season, will visit what is now known as Leadville camp, formerly Summit camp, on the Tulameen side of the Hope mountains divide.

Mr. James Cronin has retired from the management of the Standard Silver Lead Mining Co.'s mine and concentrating mill in Silverton camp, Slocan Lake District, B. C.

Mr. A. W. Davis, of the Consolidated Mining and Smelting Co.'s mining engineering staff, was lately in Leadville camp, Tulameen district, looking over mineral claims there.

Mr. Ivan de Lashmutt has been appointed manager for the Standard Silver-Lead Mining Co., and will have his headquarters at Silverton, B. C.

Mr. W. B. Dornberg, of Spokane, Washington, manager for the Treasure Mountain Silver-Lead Co., which has during the last two years done a lot of development work on its group of claims in the Tulameen-Hope district, was a recent visitor to the Coast cities —Victoria and Vancouver.

Mr. W. J. Elmendorf, general manager for the Portland Canal Tunnels, Ltd., has gone to Glacier Creek, Portland Canal mining division, to spend the fine-weather season there, superintending the work of driving the 2,300-foot crosscut tunnel his company has in hand. About one-half the distance has been driven since operations were commenced last autumn.

Mr. Evan Evans, one of the Provincial Government mine inspectors, who for the last three months has been relieving Mr. James McGregor, of Nelson, mine inspector for West Kootenay and Boundary districts, has returned to East Kootenay, Mr. McGregor having resumed duty after his vacation.

Mr. A. S. Hamilton, master mechanic for the Western Fuel Company, at Nanaimo, Vancouver Island, is the inventor of the "Nanaimo" safety cap box, for the safe-keeping of dynamite caps in readiness for being affixed to fuse. Two of these boxes—one a locked box and the other a smaller one without lock, the latter suitable for the use of prospectors—were shown and described at the meeting of the Western Branch of the Canadian Mining Institute held at Rossland, B.C., on May 22nd and 23rd.

Mr. Robert R. Hedley has returned to Vancouver from examining mining property on Moresby Island of the Queen Charlotte group, British Columbia. Mr. Hedley is arranging to develop one of the properties on which he saw a promising showing of copper ore.

Mr. A. G. Larson, of Vancouver, B.C., is making a periodical visit of inspection to the Slocan Star, Lucky

Jim, and other mines in Kootenay district, in the capacity of consulting engineer to the companies owning them, respectively.

Mr. R. H. Ley, formerly practising as a custom assayer at Nelson, B.C., and now with the Giant Powder Co., Inc., was recently knocked down and injured by an automobile, in Vancouver.

Mr. Richard Marsh, some years ago connected with mining in Rossland camp, and since then at Spokane and Republic, Washington, has been appointed superintendent of the Yankee Girl gold mine, at Ymir, B.C., in place of Mr. Ivan DeLashmutt who is now manager for the Standard Silver-Lead Mining Company.

Mr. R. G. McConnell, of the Geological Survey of Canada, will shortly visit the Britannia copper mine, near Vancouver, B.C., to obtain data concerning that important mine for the information of the International Geological Congress excursion party to visit the Canadian West next August.

Mr. H. J. C. McDonald, resident superintendent at the Granby Consolidated Company's Hidden Creek mines, Observatory Inlet, has been paying a visit to Phoenix, Boundary District, B.C.

Mr. R. G. McFarlane, of Sudbury, was in Nelson, B.C., last month, visiting with relatives.

Mr. J. M. Turnbull, of the Consolidated Mining and Smelting Company's mining engineering staff, is in the Skeena district, British Columbia, examining mining properties.

Mr. W. J. Watson, manager for the Tyee Copper Company, has arrived in London where he went to discuss with the directors matters in connection with the company's future operations in British Columbia.

Mr. Bruce White is stated to have gone to the Slave Lake country to investigate the mineral resources of that region. He has been mining in British Columbia, chiefly in Slocan and other parts of West Kootenay, for a number of years.

Mr. R. P. Williams, of Vancouver, B.C., for years representative in Western Canada of the Canadian Rand and Jenckes Machine Companies, was recalled to New York recently to consider business offers that may require his removal to that city.

Mr. F. R. Wolfe is manager for the Florence Mining Company, which is operating a small mine in Ainsworth mining division, British Columbia.

Mr. J. A. Whittier, for years mining in Slocan District, has for some time past been resident in Vancouver, B.C.

Mr. H. C. Bellinger, general manager of the Great Cobar, Ltd., left San Francisco, California, on May 6th by the S.S. Ventura on his return to Cobar, New South Wales, Australia. In its April number, The Mining Magazine, London, England, said editorially: "Owing to the interruption to smelting during the Easter holidays, the March returns from Great Cobar are disappointing. So was the special meeting, called to enable Mr. H. C. Bellinger to address the shareholders. He explained the difficulty of obtaining an adequate supply of labour, and confirmed the estimates previously made, but gave no fresh information. In his reticence he was wise. Great Cobar has had enough said and promised about it, and if the performance has repeatedly fallen short of the promise, it is only fair to say that Mr. Bellinger deserves more sympathy than blame. He has proved his technical skill abundantly, and, so it seems to us, also his patience and loyalty, for no mine manager during the last three years has had to face repeatedly so many difficulties, due to no fault of his own. The labour troubles at Great Cobar would have broken the spirit of any ordinary man. We shall be glad to chronicle the success of the enterprise for his sake, as well as that of the proprietors." Mr. Bellinger's many friends in Canada will gladly "second the motion."

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## PRINCIPLES OF MINE VALUATION

By JAMES R. FINDLAY

(Concluded from last issue.)

It is a curious thing, which anyone can observe by watching stock quotations, that the prices of mining stocks vary almost parallel with the price of the metal itself. When copper metal goes down, copper stocks go down. I always used to think that this was illogical, but I have come to the conclusion now that the public, which bases its valuations on present commercial conditions, has been more logical, on the whole, than the mining engineer, who has laid so much stress upon the life of a mine and the uncertainties of its future.

The question of the life of a mine is not to be overlooked, by any means. In many cases that is the most vital factor, particularly in the case of gold mines, because there fluctuation of price does not enter. Take, for instance, the Goldfield Consolidated. There is a property which has been making a spectacular showing in dividends, but it has always been recognized that its life was uncertain; and now, in spite of the fact that for two years it has been paying very large dividends, the price of the stock has been so low that the dividends have equalled 50 per cent. of its market value. Recently the stock has been selling for $1.75 per share; the actual dividends paid during the past year have been $1.60 per share. Now, if the mine were valued in the way some copper mines are valued, paying dividends, say, at the rate of 6 per cent. of the selling price, the price to be put on Goldfield stock would be $20 per share. In that mine the whole question centers on the length of its life. I speak of it because this is so contrary to usual experience. I do not know of any other case in which the public has been warned, or has become convinced of a mine's exhaustion so long in advance.

On the other hand, there are some mines with an expectation of long life which cannot show any ore reserves at all. Certain mines at Tintic, Utah, which I should be willing to value on an assumed life of five or ten years, do not show ore reserves for even three months. The reason is that those bodies grew in a fashion which prevents the ore reserves from being developed. They occur in an immense mass of limestone, through which mineralizing solutions have gone, and have been diverted by various intersecting fissures. These orebodies are irregular, sometimes small and sometimes swelling up to large size; sometimes they go down vertically four or five hundred feet, forming a pipe, then abruptly go off horizontally for four or five hundred feet, and then up again, then shooting to the right or to the left. If nothing were known about the persistence of those orebodies, one would be justified in being exceedingly skeptical about the future; but the experience of 30 years has shown that those deposits, in spite of their irregularities, are exceedingly persistent. In making his valuation the intelligent engineer will of course consider this fact a pronounced asset.

# SOME CHARACTERISTICS OF THE GOLD BEARING VEINS OF NOVA SCOTIA

By E. PERCY BROWN, Norfolk, N. S.

The accompanying sketch, a cross-section of the workings of the Brookfield Mining Company, Queens Co., N. S., taken from a survey made by the writer in 1898, shows the three distinct classes of veins which occur in Nova Scotia.

These veins are known locally as "Main," "Fissure" and "Angular," and while it is admitted that these designations are indefinite and confusing, yet until a more scientific system of classification has been adopted, the use of the local terms is, perhaps, permissible.

The main veins "A" are usually considered as typical of the gold measures of Nova Scotia and they lie inter-bedded conformably between the slate and quartzite.

The fissure vein "B" cuts the strata both in strike and dip, the strike of the fiussure at this place is about east and west, that of the strata north-east and south-west. The dip of the strata is 69° north, while the vein dips about 63° south. Throughout its course the dip and strike of the vein are almost independent of the rock traversed.

The angular vein "C" lies in the hanging wall of the fissure and by some might be considered a part of it. This is, however, not the case, for it is just as distinct in its characteristics as are the others. It joins the fissure at the point "D" and almost touches it again at "B." This vein changes its direction with each stratum that it crosses as can be seen in the sketch. It traverses the quartzite almost at right angles while it runs with the bedding of the slate. In crossing a large belt of "semi-whin" (i.e. intermediate between slate and quartzite) the course of the vein is intermediate between the angle at which it would cross a belt of slate and that at which it would cross a belt of quartzite.

It can thus be seen how distinct are the characteristics of the three veins. And if we consider the three from a genetic standpoint, it may give us yet a further insight into their distinctive points.

We are all familiar with the idea of the process of gradual folding of the strata during which the main or interbedded veins are supposed to have been formed. During this folding or subsequent to it, we may readily imagine that the rock gave way in certain favourable directions due to powerful stresses set up in the rock by the action of folding or by some independent force shearing the rocks already folded. Thus would the so-called fissure veins be formed.

Probably during the formation of the fissure or perhaps after its formation, but before the crevice had been filled, if that vein point is permissible, a portion of the hanging wall gave way and as it were dropped into or towards the fissure. Thus the angular vein may have been formed.

It may be noted that opposite the position of the angular the fissure vein is small and irregular.

Many will say that the above is an old story and that everyone familiar with gold mining in Nova Scotia recognizes these different veins. Doubtless this is so, but I have noticed that the three classes are continually confused. Only a few weeks ago I read an article in the leading Mining Journal of Canada on the Gold Fields of Nova Scotia wherein the writer stated repeatedly that there were but two kinds of gold-bearing veins in Nova Scotia, interbedded and cross-veins.

I wish to make as sharp a distinction as possible between the fissure and angular veins. Both are "cross-veins" i.e. they cut across the bedding of the strata, but there the similarity ceases. The course of the fissure, as I have shown above, is almost independent of the rock traversed. Several of these veins have been traced for considerable distances. A "gouge," "hulk" or salvage usually occurs on one wall or both.

The course of the angular is extremely irregular and usually extends but a comparatively short distance. As a rule there is no seam between the quartz of these veins and the country rock.

The angulars are usually associated with main or fissure veins and often form a network of quartz frequently connecting one vein with another. They are sometimes quite large and may extend for some distance in a straight line, particularly if the nature of the country rock remain the same. In this case they are usually made up of coarse grained white (bull) quartz.

There will be no need to give examples of main veins as many of these are well known to all interested in the gold fields of Nova Scotia.

Perhaps the best example of the fissure vein is found in the District of Leipsigate, Queens Co., Mr. E. R. Faribault, the painstaking and efficient geologist of Nova Scotia, to whom we owe what tabulated information we possess regarding Nova Scotia gold fields, says, in the Report of the Geological Survey, 1904:

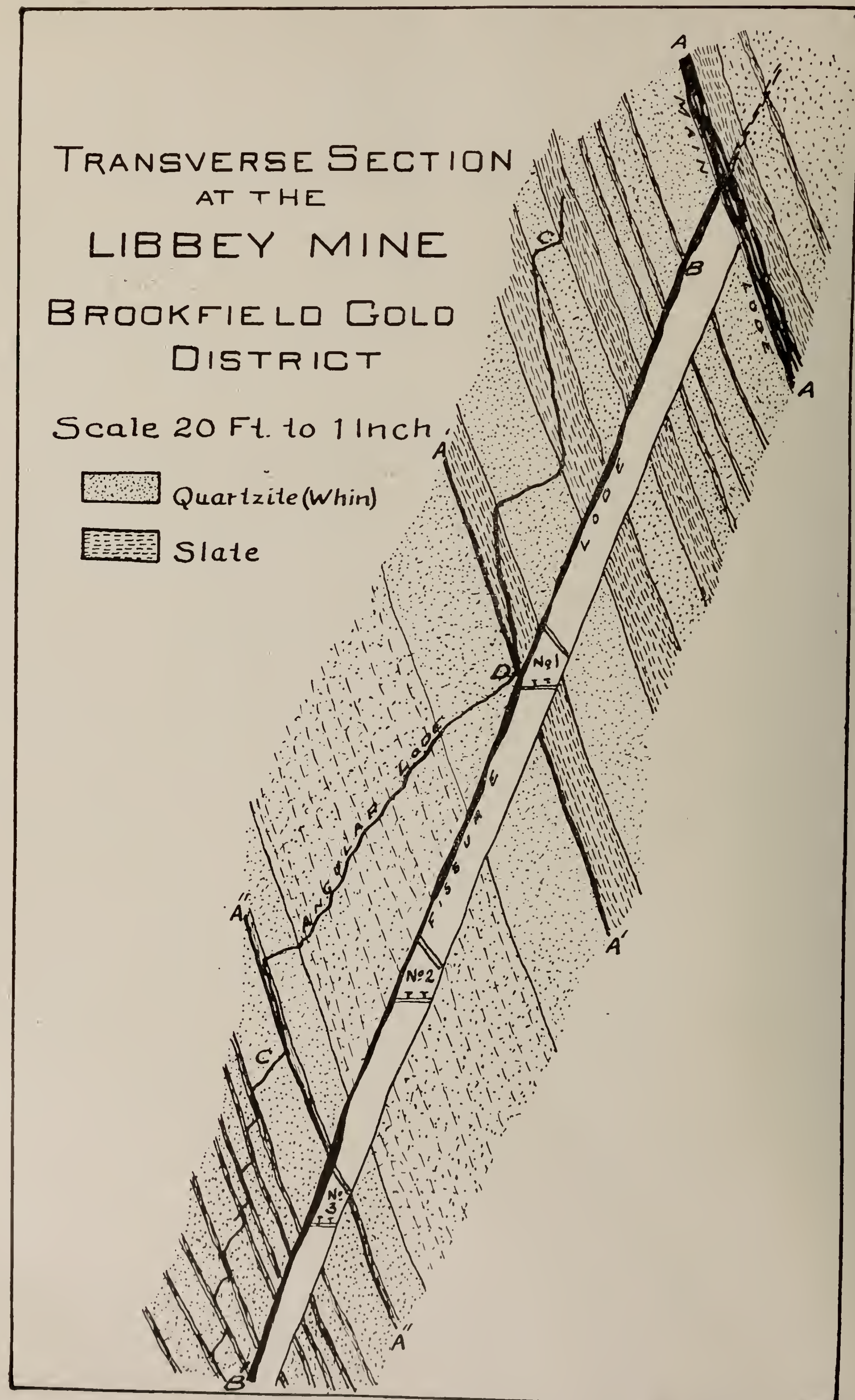
"One fissure vein, the Leipsigate, owing to its permanency and size and the uniformity of its ore values has made the district famous. In many respects it is probably the most typical true fissure vein in the Province and gives promise of being one of the best producers. It is situated in the most southerly part of the district, some 1,200 feet south of the lake, and has been traced for 9,000 feet, of which 4,350 feet have already been opened in three different sections. . . ."

Several other examples of this class of vein exist in the Province and have been developed in two cases at least to considerable extent, but the data bearing on most of these is practically nil. A number of veins of the Angular class have been worked, usually in connection with the working of some interbedded veins, and data in these cases is also lacking.

Doubtless the most important question regarding our gold measures is the location of pay shoots. Some well-defined zones have been followed to considerable depths, 1,000 feet or over, though the finding and following of these was often due more to good luck than good management. How many more there may be throughout the Province we cannot say. How many of the rich outcrops which have been cut on the surface and worked to depths of 200 or 300 feet continue in depth we do not know.

It would appear that each class of vein must be studied by itself as the occurrence of the paystreak seems to be different in each kind of vein.

In some districts the enriched portion of the main lode occurs at a definite distance from the dome or axis of the anticline. That portion of the vein where it begins to curve rapidly or as it is sometimes called


TRANSVERSE SECTION
AT THE
LIBBEY MINE
BROOKFIELD GOLD
DISTRICT
Scale 20 Ft. to 1 Inch
Quartzite (Whin)
Slate
A
B
C
D
A'
A''
No 1
No 2
No 3
Lode

the "shoulder" often contains the highest value. As the apex of the dome pitches in a certain direction the enriched portion continues approximately parallel with it and a pay shoot is formed. In some cases it has been noticed that where the dome broadens the zone of enrichment recedes from the axis and where it narrows the zone approaches the axis.

In other cases the pay zones on the interbedded veins appear to be formed by some irregularity in the folding by which a crumple has been made in the belt. Even when this irregularity is very slight it seems to exert a great influence on the distribution of values. Then again enrichment on these veins occurs where angulars join them, as indeed is often the case, either at a shoulder or in the case of a crumple as described above.

In the case of fissure lodes the presence of angulars also seems to affect the values, but the pay shoots on these veins seem to depend mainly on the intersection of favourable strata. As an example, the pay shoot on the fissure vein shown in the sketch occurred at and just below its junction with the main vein (A) and its accompanying band of slate. This stratum of slate, particularly in the upper levels, was soft, black and well mineralized. Two other main lodes were cut by the fissure at A′ and A″, though these were very small near the surface. The pay-shoot continued for a distance of some 2,000 feet to follow these intersections (vide Map of Brookfield Gold Mining District, E. R. Faribault, Dominion Geological Survey).

The pay streaks on the fissure vein of Leipsigate are well described by Mr. Faribault in the report before referred to (Dominion Geological Survey, 1904). He says, "It has been observed that the ore shoots occur at the intersection of the vein with certain strata of soft rock which are apparently more favourable to fracturing, infiltration and deposition of gold. This important feature, already observed in several other fissure veins, deserves much attention in mining. These intersections are necessarily continuous for great lengths and a succession of them probably recur in depth. It should, therefore, follow that the ore shoots are quite extensive in length and that those already developed are likely to be underlaid by a succession of others. This should encourage development to a much greater extent."

There is an old saying that the worse the wall of the mine, the better the values. This I have found to be remarkably true in many cases of both interbedded and fissure veins.

The enrichment of the angular lodes seems to be more irregular and uncertain usually occurring, however, at the intersection of favourable strata, or where the angular cuts interbedded or fissure lodes.

This question of pay shoots seems to the writer to be a most vital one and it is most important that all available data concerning values and peculiarity of structure met with underground should be carefully recorded from the earliest start of the mine. In a new district this is particularly true and should not be lost sight of.

In Nova Scotia one can see many cases where thousands of dollars could have been saved had such records been kept, and mines which have been ruined by improper development might still have been yielding steady returns.

The late Dr. Henry Yuill Hind, writing on the Waverley Gold District, Nova Scotia, as far back as 1869 (less than ten years after the discovery of gold in Nova Scotia), says:

"It is much to be regretted that no reliable data exist from which diagrams showing the auriferous zones on these leads can be constructed. The circumstance of the quartz from all being mixed before crushing makes it impossible to collect the necessary observations." And, again:

"Plans of all the workings are also essential, showing at least monthly progress. . . . . but if no monthly plan of workings is kept on record, all is confusion. With the single exception of a plan and section made some years ago by Mr. Bell, together with a lithographed plan of the whole district, showing the position of the several properties, I was unable to obtain any plan of surface workings, much less any plan of the underground workings, and the agents of the different companies uniformly informed me that none to their knowledge were in existence."

Had Dr. Hind's advice been followed throughout Nova Scotia the history of gold mining here might have been different. I believe that to-day a careful study and correlation of all data and available information regarding underground workings, structure, values and so forth should be made in the interests of the industry.

## MINING DIVIDENDS

Messrs. Thompson, Towle & Co., of New York City, have compiled and published a statement showing the production, estimated earnings, and dividends of the important copper mines of the United States, Mexico, and Canada. Only two companies operating in Canada are included, namely, the British Columbia Copper Co. and the Granby Consolidated M. S. & P. Co., both in British Columbia. The Britannia was either overlooked or the corresponding particulars of operations and results were not obtainable. The published particulars for 1912 follow, with estimated approximate figures for 1913 shown in brackets: British Columbia Copper Co., number of issued shares, 591,709; par value \$5; copper produced, 11,146,000 lbs. (12,000,000 lbs.); cost per pound, 12.86 cents (10 cents); earnings per share, 72 cents (with copper at 15 cents a lb., \$1.01; earnings each one cent change, 20 cents a share); amount and date of last dividend, 15 cents a share, January 15, 1913. Remarks: Cost in 1912 due principally to lower grade ore treated. Granby Consolidated: Number of issued shares, 149,648; par value, \$100; copper produced, 22,630,000 lbs. (22,000,000 lbs,) cost per pound, 9.50 cents( 9.50 cents); earnings per share \$10.60 (with copper at 15 cents a lb., \$8.09; earnings each one cent change, \$1.47 a share); amount and date of last dividend, \$1.50, March 1, 1913. Remarks: Company owns Hidden Creek property. Has \$1,500,000 convertible bonds. Estimated production, cost, and earnings per share when reduction plants shall have been brought up to capacity: Production, 45,000,000 lbs.; cost 9½ cents; earnings per share, with copper at 12 cents, \$6.84, at 13 cents, \$9.58, at 14 cents, \$12.31, at 15 cents, \$15.05, at 16 cents \$17.78, at 17 cents \$20.52.

Metallurgical and Chemical Engineering, New York, printed in its May number a two-page illustrated account of a complimentary dinner given on the evening of April 19 by the chemists of the United States to Dr. William H. Nichols, the president of last year's

International Congress of Applied Chemistry, and to Dr. Bernhard C. Hesse, the secretary of the Congress, as a mark of their appreciation and affection. The dinner was held at the Chemists' Club in New York City, and some 225 men assembled to do honour to their guests. The following excerpt from that journal's account of the proceedings may interest, among others, readers of the Canadian Mining Journal in Canada who are interested in the Granby Consolidated M. S. and P. Co., of which, among his many activities, Dr. Nichols is president:

"Dr. Wilder D. Bancroft, of Cornell University, spoke as past-president of the American Chemical Society, and of the American Electrochemical Society. He spoke exceedingly well, both concisely and to the point. Starting with a funny church collection story, he passed to a review of the success of the Congress—for it was a great success—and of the men who made it such. Morris Loeb lost his life at it. Dr. Rosegarten nearly did. Mr. Matheson produced a surplus and Dr. Hesse gave up a year and a half of his life to produce thirty volumes of transactions and a great many tons of literature. And as to Dr. Nichols' work as president, if we should ever go again through such a Congress in our lifetime (which Heaven forbid) and if we should be forced to get along without Dr. Nichols as president (which Heaven forbid), we might think in poetry:

Twinkle, twinkle, little star,
Riding on a trolley car.
Trolley car went off the track.
Gee, I wish we had our Nickels back."

Among other speakers was Dr. David T. Day, of Washington, D.C., who, in order that Dr. Nichols and Dr. Hesse should take with them into later life the memory of the appreciation and affection of their American fellow chemists, presented in the name of the American chemists, to Dr. Nichols, a counterpart in silver of the desk set in the Royal Treasury in London, and to Dr. Hesse a silver loving cup.

The Traylor Engineering and Manufacturing Company, with works at Allentown, Pennsylvania, U.S.A., announces that it is now building three 50 by 360-in. water jacket copper-smelting furnaces for the Granby Consolidated Mining, Smelting & Power Co., Ltd., these being only a part of a very large order received from that company.

The United States Congress has authorized the expenditure of $2,596,000 for a building to accommodate the Geological Survey, the Bureau of Mines, the Reclamation Service, and the Indian Office, all bureaus of the Interior Department. Plans for construction will go forward at once.

# THE DOME ANNUAL REPORT

The annual report of the Dome Mines Company for the period Nov. 30, 1911, to March 31, 1913, was presented by Mr. Ambrose Monell, the president, at a meeting of the shareholders in Toronto on May 27th.

The most important feature of the meeting was the decision to increase the capital from $3,500,000 to $5,000,000 in $10 shares. However, the new shares will be issued only as actually required for increasing the capacity of the mill. The mill at the present time contains only forty stamps. It is proposed to instal sixty more stamps, and to add the necessary subsidiary machinery.

During the period covered by the report the mill handled 101,812 tons of ore. The average gross value of the ore was $10.25 per ton. The net profit per ton was $5.009. As pointed out by Mr. Monell, there is every reason to expect a considerable reduction in operating costs. The labour troubles of the past, and the large proportion of development work being done have necessarily enhanced the expenditure per ton of ore mined and milled. Also, the cost of power has been very considerably cut. Relatively cheap hydro-electric power is now available.

As mentioned above, the tonnage milled was 101,812 tons. The total yield by amalgamation was $460,581.62. The yield by cyanidation was $483,513.31. The total value was $1,043,994.93. The actual percentage of extraction was most creditably high, standing at 95.63 per cent.

The mining and milling costs were made up as follows:—

| | |
|---|---|
| Mining cost per ton | $1.31 |
| Crushing cost per ton | .24 |
| Milling cost per ton | 2.11 |
| General | 1.29 |
| Total | $4.95 |

Altogether 128,015 tons were mined; 102,836 tons were sent to the mill. The difference was waste.

Judging from the tenor of the annual report great pains have been taken not to over-estimate the ore reserves. Where positive assertions are made they have been substantiated with the utmost care. Mr. Mein estimates the ore developed above the 45-foot level, as at March 31, 1913, at 315,528 tons, carrying gold to the value of $7.50 per ton. Added to this quantity there is a further reserve of 250,000 tons between the 45-foot and the 100-foot levels. Mr. Mein has abstained from placing any definite value upon this body. He states that much more work must be done before it can be properly estimated.

The following is a brief tabulation of the total general expenditures and earnings:—

| | | |
|---|---|---|
| Mining costs | $157,666 27 | |
| Milling | 214,788 15 | |
| General works expenses | 131,096 72 | |
| | | $503,551 14 |
| Gross earnings | | $540,443 79 |
| **Selling Expenses—** | | |
| Bullion, shipping | $1,663 96 | |
| Bullion insurance | 1,551 51 | |
| Bullion refining | 2,623 07 | |
| | | $ 5,838 54 |

| | | |
|---|---|---|
| General expenses | | 24,649 15 |
| Net earnings | | 509,556 10 |
| **Written Off—** | | |
| Development | $61,087 20 | |
| General charge | 53,516 21 | |
| Fire loss | 24,124 47 | |
| | | $138,727 88 |
| Transferred to balance sheet | | $371,228 22 |

It is quite worthy of note that 93,581 tons of all the ore milled came from surface "glory-holes."

Harking back to the question of ore reserves, it may be mentioned here that, by horizontal measurement, 46,750 square feet of ore has been exposed on the 100-foot level. Until further work has been done below this level this ore is given no definite place in the reserves.

Certain diamond drilling results were also mentioned in Mr. Mein's report.*

| Borehole.* | Length of mineralized ore. | Assay value. |
|---|---|---|
| No. 12 | 57 ft. | $7.18 |
| No. 13 | 168 ft. | 4.15 |
| No. 20 | 478 ft. | 3.69 |
| No. 23 | 273 ft. | 4.56 |

His own explanation of the inferences to be drawn from these results is as follows:

"Selected portions of these great lengths of core, of course, would show considerably higher results than the foregoing averages. But a classification into higher and lower grade cannot be reasonably attempted until the trend of the zones or lenses to be followed in mining is more fully proven by development in the region of these borehole intersections. For examples: 97 ft. of the 273 ft. of ore in No. 23, averaged $6.41 and 44 ft. of No. 20 assayed $10. Too much weight, however, should not be attached to the assay values of borehole intersections, which are commonly unreliable as samples for valuation, though very important as a guide to development.

"In shaft No. 2 itself the ore body was cut at a depth of 172 ft., which had not been indicated in any of the boreholes. Sampling results averaged $4.87 for a distance of 85 ft., with the bottom of the shaft still in ore at a depth of 257 ft. The strike of the miners interrupted the sinking of the shaft and a crosscut was started south. This crosscut is now in 200 ft. and averages $5.39 throughout its entire length. Including borehole No. 23, which lies above the crosscut on the west side, we have, therefore, in this vertical plane, representing the extension of our declared ore values three sides in ore showing: 85 ft. of the shaft averaging $4.87, 200 ft. of the crosscut averaging $5.39, 97 ft. of borehole averaging $6.41.

"Immediately to the west (200 ft.) borehole No. 20 intersected 478 ft. of ore, averaging $3.69, of which 75 ft. showed $5.15 per ton.

"All new results obtained on the deeper extensions of the famous Dome of rich quartz that marked the outcrop of the veing give us further hope that a longer life with an increasing scale of operations on a lower grade of ore may be confidently anticipated."

For this moderate and careful policy, Mr. Mein deserves all possible credit. He is deliberately taking the risk of misinterpretation. Doubtless there are numberless parasites of the stock market who will be only too glad to interpret his statements in the most depressing manner. Just here a comparison between the Hollinger and the Dome is illuminating.

| | Hollinger. | Dome. |
|---|---|---|
| Ore reserves, tons | 644,540 | 509,556 |
| Average value, per ton for the 250,000 tons below the 45-foot. | $21 44 | $7 53 |
| Apparent net profit per ton | $14 70 | $2 58 |
| Apparent net value of ore reserves | 9,474,738 | 1,314,654 |
| Market value of mine, taking Hollinger at $17 a share and at $15 a share | $10,200,000 | $5,250,000 |

None of the Executive officers of the Dome Mines Company receives a salary.

# SPECIAL CORRESPONDENCE

## NOVA SCOTIA

### MINERS' RELIEF SOCIETIES.

There has been discussion in the Nova Scotia Lower House regarding the Provincial Workmen's Compensation Act, and the statement has been made that the miners of the province would be better off under the provisions of the Act than they are under the present system of relief societies. It must be admitted that not every colliery company has placed its house in order in this regard, but the workmen of those companies who have properly constituted relief societies are distinctly better off as they are. In drawing a corollary between European countries and Nova Scotia it must not be forgotten that in the older countries friendly societies exist on a scale of great magnitude, and that there also exists a vast organization of humanitarian institutions, such as hospitals, asylums, and the much maligned and despised "poorhouses" that every European civilization has to maintain. Many of these institutions are richly endowed by benefactions of forgotten centuries. In Nova Scotia, however, conditions up to the present time have fortunately not necessitated public benefaction or state provision on a large scale, but in the large industrial towns of the Province rural conditions are changing to urban conditions, and the presence of the poor and indigent is being forced on the attention of a population which hitherto has not apprehended the meaning of poverty or the stigma attaching to the "workhouse," the "Bastile," as it is bitterly designated in many parts of England. Yet even in England, the operations of the Compensation Act have demonstrated the inadequacy of the hitherto existing provision against sickness, and the Compensation Act was followed by the National Insurance Act. The miners' relief societies in Great Britain have one by one given up the ghost, have wound up their affairs and made final provision for the dependents on the funds.

In Nova Scotia, the relief societies are the only real provision the miner has against sickness. What few friendly societies exist do not welcome the miner into their ranks, and the insurance companies looks askance at him. Both are mistaken in supposing the miner to be an undesirable risk, but that does not help the miner. The Relief Society affords relief in both sickness and accident, two-thirds of the benefits disbursed being for disability caused by sickness and only one-third for accident. The cost of the present system to the coal companies is greater than the burden they would have to assume under a workmen's compensation act. It must be accepted, from European experience, that the operation of a Compensation Act which places the entire burden on the employer, will also extinguish the relief societies, and will in turn require supplementary legislation to create the provision against sickness, of which the miner will be deprived by the passing of the relief societies now exist, must be prepared to tread a force a compensation act where properly constituted relief societies no wexist, must be prepared to tread a long and devious road leading maybe in a different direction to that imagined.

## MINE RESCUE APPARATUS ON THE "FREE LIST."

The changes in the customs tariff announced by the Minister of Finance include "miners' rescue appliances, designed for emergency use in mines, where artificial breathing is necessary in the presence of poisonous gases, and automatic resuscitation apparatus for artificial breathing, to aid in the saving of human life." These are placed on the free list. For some time past the duty on mine rescue apparatus has been rebated upon application, but it is much more satisfactory to have these appliances placed definitely on the free list, as they are in every other country of importance. The provincial laws of several of the Western Provinces compel the provision of rescue appliances at mines, and it may be asked whether the Federal Government could in any case collect customs duties on articles which are required by law to be provided, when such articles are not manufactured in Canada.

## DOMINION COAL OUTPUTS.

The Glace Bay mines produced 200,000 tons in the first half of May. The output was a little restricted by absenteeism, not unnatural in the first days of springtime. The output for the month should reach 405,000 tons, which will place the production for the five months ending May 30th approximately 170,000 tons in advance of 1912 over the same period. St. Lawrence shipments obtained a good start through the favourable weather of the latter half of April.

The S.S. "Glace Bay" became a total wreck off Mistaken Point, near Trepassey Bay, Newfoundland, on the 2nd May. Very many stout ships have met their end in this inhospitable vicinity. The "Glace Bay" was a new ship, of 10,000 tons cargo capacity, specially constructed for the coal freighting trade, and was on a long-term charter to the Dominion Coal Company. The loss will be to the owners, but the Coal Company will lose the services of a fine vessel during the coming shipping season. It is worth a question whether that portion of the coast immediately westward of Cape Race could not be protected by submarine bells. The "Glace Bay," like a majority of the Dominion Coal Company's fleet, was fitted with a submarine bell equipment. Lighthouses are helpless in a Newfoundland fog, and fog-horns are notoriously misleading at times, in fact, the "Glace Bay" is stated, on newspaper authority, to have been misled by a locomotive whistle. The Canadian Government maintain the Cape Race Light, and the suggestion just made may be worth consideration.

**Sorting High-Grade Ore at Foster-Tough**—(See Opposite Page.)

## INTERCOLONIAL COAL CO., WESTVILLE, N.S.

There has been a troublesome fire in the Drummond Colliery of the Intercolonial Coal Co. for some weeks past, but it is now stated by the management that it will be only a brief period before the fire will be completely under control.

It is also stated that the company contemplate the re-opening of the old Scott pit, and vigorous development of the workings in the bottom coal in the Drummond Colliery. It is hoped to attain a daily output of 2,000 tons from all sources of supply.

As the workings of the Drummond slope and Acadia slopes have both long since passed through the point where it was supposed there existed a displacement in the strata of 2,600 feet, without any disturbance being actually encountered, some interesting speculations become possible on the structure of the Pictou coalfield. If the Geological Survey could delegate a competent paleontologist to make a systematic study of the coal seams in Nova Scotia, and their adjoining strata, some knotty points regarding correlation of seams might be cleared up. Discussions as to the relative identity of seams in Nova Scotia coalfields have been going on for fifty years, and the same uncertainty still exists in many cases.

**Foster-Tough Claim**
**Inclined Shaft from which $38,000 has been taken to date**

# ONTARIO

### PORCUPINE, SWASTIKA AND KIRKLAND LAKE.

The fact that one unit of each power plant has been repaired so that it is again running has relieved the situation in the gold camp. After the breakdown of the Sandy Falls plant there was not a kilowatt in camp, and all those without auxiliary steam plants had to shut down. The Hollinger mill was shut down for some time. Now the first unit of the Sandy Falls plant has been repaired, the Hollinger is supplied. The Dome has been running its entire plant with steam, but will benefit by the fact there will now be available 1,500 horse power from Wiawaiten Falls.

At the annual meeting of the Dome Mining Company this month it is anticipated that the announcement will be made that ore reserves warrant the addition of another 60 stamps to the present mill, bringing its daily capacity up to about a thousand tons per day. This will more than double the capacity of the present plant. How this addition will be financed has not yet been made public, but it is probable that it may be undertaken by increasing the capitalization from $3,500,000 to $5,000,000.

The five-stamp mill at the Foster mine at Gull Lake, near Swastika, is now running. The stamps were first dropped on May 12th, and the first run was made on May 14th. On May 15th, the mill commenced to run regularly. The ore is coming from the dump. It is estimated that there are 2,000 tons broken and raised.

The high grade ore will continue to be handpicked and shipped. The little plant will treat 15 tons per day.

**No. 3 Vein Foster-Tough Claim, Kirkland Lake**

The Lucky Cross mill, of Swastika, commenced actual treatment of ore about May 1st, since which time the mill has been in practically continuous operation.

Assays of the head made by the company's assayer for one week ran $25 to the ton but the ore in this instance came from a rich spot on the 200-foot level, and is too high to be representative. The tailings leaving the mill during the same period gave a value of only 31 cents, showing an extraction of better than 98 per cent. About twenty tons are being treated daily, but this will be gradually increased.

It is expected that the additional battery of five stamps will be operated about the middle of June.

The final payment for the control of the City of Cobalt was made on May 16th. Though negotiations have been conducted through the house of Aemelius Jarvis & Son, in Toronto, it is an open secret that they are buyers for interest associated with the Cobalt Townsite. As the issued capital of the City of Cobalt Mining Company is $1,500,000, and the deal was for 80 per cent. of the stock at 55 cents a share, the whole transaction would represent $660,000. One hundred thousand dollars was paid.

## COBALT, SOUTH LORRAIN, GOW GANDA, AND ELK LAKE.

The production of the McKinley-Darragh-Savage mines for the month of April was 171,028 ounces. The mill treated 4,600 tons. While this production is considerably larger than that for the previous month, it is less than the general average for last year. This is explained by the fact that no high grade has been mined for the past two or three months to sweeten the usual milling ore and also that there has been no attempt to keep up the usual amount of silver ore from the Savage. A little more high grade has just been encountered on a stope on the No. 1 Swamp vein. At the 160-foot level it is now showing four or five inches of high grade.

The addition to the McKinley-Darragh mill is running and 75 tons per day is being brought over the aerial tramway from the Savage to the mill. In a few days when a new tube mill is working a further 35 tons of ore will be treated from the McKinley itself, making the daily record of the mill 275 tons. Each bucket on the aerial tramway from the Savage to the McKinley mill has a capacity of 700 pounds, and thus can be transported ten tons an hour. Previously for several years the Savage ore has been jigged in the rock house at the mine, the fines going to the dump. It is estimated that they will run from twenty to fifteen ounces to the ton. There are sixty thousand tons assembled on the dump, and, with the stamps available for the Savage, it will take three years to run the dump alone. The addition to the McKinley mill makes it the second largest in camp.

The Temiskaming and Hudson's Bay Mining Company has just declared another 300 per cent. dividend, payable May 21st. This makes their third disbursement this year. Already this year the company has paid or will have paid on May 21, 900 per cent. on the issued capital of the company, or $69,989.

The only point from which ore was shipped on the T. & N. O. Railway, exclusive of Cobalt, last month, was from Gow Ganda. Both the Mann mine and the Miller Lake-O'Brien shipped high grade to the Deloro Mining & Reduction Company at Marmora. The shipments were as follows:

| | |
|---|---|
| April 3—Mann .................... | 40,000 |
| April 8—Miller Lake-O'Brien....... | 50,380 |

All this ore was teamed from Gow Ganda to Elk Lake and there put on the cars instead of being teamed to Charlton. But since the Gow Ganda-Elk Lake road is still in wretched condition, it is costing $30 a ton to bring out to the steel.

It is understood that there is a deal on for the sale of the Miller Lake-O'Brien, and the Millerett for a large sum of money. An English company is negotiating for the property.

The hydraulicking plant on Nipissing Hill sluicing off the overburden for prospecting will this year be worked night and day, not merely one shift as last year. The ground to be cleared is all first-class prospecting territory. Last year some of the best prospective ground was left in order to fully strip the ground, to be later occupied by the tailings from the low grade mill, and the work has been taken up from this point. The overburden will be removed from a point below the low grade mill to the Chambers-Ferland line, and also between the low grade and the high grade plants. This is 75 per cent. of conglomerate and should yield good results. It has been trenched previously.

During the season 1912, 33.2 acres of ground were cleared, the average depth of the soil was 4.75 feet. In the vicinity of vein 92 one of the discoveries made produced 27,000 ounces by open cutting. The other veins found will be opened up later.

The production from the Casey-Cobalt mine for the week ending May 3rd, was 20,160 ounces. For the week ending May 10, it was 20,300 ounces. This is considerably higher than any of the April weekly records, which ran about 16,000 ounces. The agreement with the Northern Canada Power Company to build a line out to the mine will enable the company to materially reduce their costs. They are at the present time burning wood as the price for hauling coal from New Liskeard is prohibitive. The thousands of cords of wood stored in the yard at the Casey-Cobalt will easily carry the company over this year, and they will thereafter be able to run with electricity.

# BRITISH COLUMBIA

Revised statistics of mineral production in British Columbia in 1912 will, when published, show that the preliminary estimate of the Provincial Mineralogist, given out about the middle of January, was within $200,000 or $300,000 of the actual recorded value of the production. Exact figures are not yet available for publication, but it is known that the total is in excess of $32,000,000. The approximate proportions are:—Metalliferous minerals, $18,000,000; non-metalliferous minerals, $14,000,000. In round figures the value of the respective minerals included may be stated as about as follows: Gold (placer and lode), $5,800,000; silver, $1,800,000; lead, $1,800,000; copper, $8,300,000; zinc, $300,000; coal and coke, $10,500,000; building materials, etc., $3,500,000. As already stated, these are not exact, but they are near enough to be accepted as indicating about what the official records may be expected to show when they shall be available for reference.

Placer gold reached the highest total in the four years since 1908. Lode gold was within $11,000 of the highest total on record in the province, namely, that for 1910. Not so favourable is the comparison of total gold—placer and lode together—for in four previous years was the total of 1912 exceeded, as follows: As against a total of less than $5,900,000 in 1912, totals of higher years were—1910, $6,073,380; 1908, $5,929,880; 1905, $5,902,402; and 1902, $6,061,409. Silver is higher in value than for any other year since 1906, and in quantity since 1905. Lead has the highest figures, both quantity and value, in five years, 1908-1912. Copper figures are the highest on record in all years, as to both quantity and value. In zinc, the comparison is not favourable to last year. Coal shows a value of nearly $600,000 less than in 1910, but it is $1,500,000 higher than the 1911 total, and more than $2,000,000 higher than that of 1909, with earlier years showing a still greater disproportion. The coke total is the highest on record as to value, but not as to quantity, for in 1905 the production was 7,450 tons greater. Taking coal and coke together, there was only one year—1910—when a higher total value was reached, that year having been credited with $321,500 more than was 1912. A considerable reduction was made in the value placed on miscellaneous products, as compared with that shown in the preliminary estimate, thus bringing the total for these below that recorded for 1911. There is much difficulty in arriving at the value of these products, for comparatively few of those directly engaged in their production will make returns. Yet it is believed the value given by the Provincial Mineralogist each year is as near as can be arrived at under the conditions.

Looking at the production returns as a whole, there is certainly good reason for satisfaction with the generally good results achieved in 1912. Lower average prices may affect the 1913 total value to an extent that will result unfavourably in making a comparison between the current year and 1912, when the time shall come for this to be done; again, there will be the effect of fresh labour difficulties on Vancouver Island to adversely affect the result of the 1913 operations, but since the year is still comparatively young, the possible troubles of the future may well be left to take care of themselves when the necessity shall arise for their doing so. Meanwhile, the fact may reasonably be made the most of that the mineral production of British Columbia in 1912 reached a total value in excess of $6,000,000 higher than any other year in the history of mining in the province, with the mining industry continuing to make good progress.

## SIMILKAMEEN.

While occasional brief news items that are given publicity tend to show that the usual good progress is being made at the Hedley Gold Mining Co.'s mine and stamp mill ,little detailed information has been received of late. However, it is expected that it will be practicable to shortly ascertain what is being done in connection with that flourishing gold-mining enterprise, and to thereafter have for publication interesting details of operations.

The position is similar in regard to the development work the British Columbia Copper Co. has latterly been doing on Copper mountain and in its vicinity, but here again the expectation is that reliable news will be obtained soon, in which case it is thought best to defer further reference to this subject, especially as various newspapers have printed items that are not similar in their statements of the position in regard to the Voigt group and other groups of claims that have been receiving the attention of the company's development parties.

It has been announced that the British Columbia Cement Co.'s works near Princeton are nearly completed; in fact it has been stated in print that the manufacture of Portland cement would be commenced there early in May. Those chiefly interested in this enterprise are sanguine as to its success, and they expect to show that their confidence is well grounded.

There is little that is new to chronicle concerning coal mining in the Similkameen district. At Princeton the Princeton Coal and Land Co. is continuing its efforts to enlarge the market for its coal and is making the product of its mine as good a fuel as modern screen and other coal-cleaning appliances admit of its doing. Little is heard now-a-days of the operations of the Columbia Coal and Coke Co., but it is known that, with fewer men in its employ than when the long cross-cut tunnel was being driven from the Tulameen river slope of the mountain, development is in progress from the direction of Collins gulch. Although the results from the larger work done in 1911 and the early part of 1912 were disappointing, it is believed the company has some good coal, and it is stated that it is now going the right way about its development. When more coal shall have been made accessible for mining the problem of the best means of getting it down to the V. V. and E. Railway, already constructed in the Tulameen valley below, will be dealt with, and preparations be made for shipping the coal.

### Coast District.

The labour troubles, concerning which information was supplied for the last number of the Journal, have become much more serious than was at first thought they would do. The mines of the Western Fuel Co., Pacific Coast Coal Mines, Ltd., and Vancouver-Nanaimo Coal Co. have all been closed. The published statements of prominent U. M. W. of A. men that all the mines on Vancouver Island are closed are untrue, for the Canadian Collieries (Dunsmuir), Limited, cantinues to add to the number of miners it has at work and to increase the output of its mines. The following monthly totals of coal produced tell their own tale: In January, 29,541 long tons; February, 30,036 tons; March, 37,241 tons; April, 39,061 tons. April production gave a daily average of 1,502 tons for the 26 working days of that month. In one week in April three steamers together took from the company's shipping bunkers at Union Bay, Vancouver Island, 10,427 tons, in the following quantities: one took 6,796 tons, another 2,279 tons, and the third 1,352 tons. The largest single day's output was 1,763 tons, on April 30. On May 3 the Fernie "District Ledger," which is the official organ of District 18, United Mine Workers of America, published this misstatement, which was printed right across the page in large black letters: "All Vancouver Island Miners now out on Strike." On May 9 it was ascertained from the company's head office that there had not been any change at the Cumberland mines of the Canadian Collieries (Dunsmuir) Limited, during the expired portion of May, except that the average daily output of coal had been increased to nearly 1,600 tons. It may be stated that in addition to making the above-mentioned production of coal the company has been doing much development work at its Bevan and No. 8 mines, the latter being a new mine now being opened. Further, that the work on the hydro-electric power system is nearing completion, so that it is expected this new system will be in operation before the end of June. The total outlay on plant equipment, railways, and other improvements, provided for in appropriations authorized by the directors, is more than $3,000,000, and of this sum nearly $2,250,000 has already been expended by the company since it acquired the Dunsmuir interests.

# STATISTICS AND RETURNS

## DOMINION STEEL OUTPUT.

The April output at the several departments of the Dominion Iron and Steel Company shows up very satisfactorily.

Records were made in the pig iron steel ingots and all wire departments, including the wire drawing, wire and galvanized nails, wire mills, all of which showed records.

The total shipments were also very large for the month, being only a shade below the highest record in steel shipments.

The following are the figures in tons of the output in the various departments of the steel plant for April:

| | |
|---|---|
| Coke | 54,010 |
| Pig Iron | 32,680 |
| Steel ingots | 31,400 |
| Steel blooms | 26,550 |
| Steel rails | 12,770 |
| Steel billets | 7,765 |
| Rods | 3,550 |
| Total shipments | 32,330 |

## COAL SHIPMENTS APRIL, 1913.

### Dominion Coal Co., Ltd.

Output and shipments for April 1913.

| | |
|---|---|
| Shipments, April, 1913 | 254.203 |
| Shipments, April, 1912 | 327,972 |
| Decrease, April, 1913 | 73,769 |
| Shipments, 4 mos., 1913 | 997,700 |
| Shipments, 4 mos., 1912 | 986,848 |
| Increase, 4 mos., 1913 | 10.852 |

### Springhill.

| | |
|---|---|
| Shipments, April, 1913 | 27,489 |
| Shipments, April, 1912 | 29,941 |
| Decrease, April, 1913 | 2,452 |
| Shipments, 4 mos., 1913 | 104.843 |
| Shipments, 4 mos., 1912 | 118,710 |
| Decrease, 4 mos., 1913 | 13,867 |

### Acadia Coal Co.

| | |
|---|---|
| Shipments, April, 1913 | 39,753 |
| Shipments, April, 1912 | 30,144 |
| Increase, April, 1913 | 9,609 |
| Shipments, 4 mos., 1913 | 151,957 |
| Shipments, 4 mos., 1912 | 118,636 |
| Increase, 4 mos., 1913 | 33,321 |

### Nova Scotia Steel & Coal Co.

| | |
|---|---|
| Shipments, April, 1913 | 46,018 |
| Shipments, April, 1912 | 51,109 |
| Decrease, April, 1913 | 5,091 |
| Shipments, 4 mos., 1913 | 155,843 |
| Shipments, 4 mos., 1912 | 153,173 |
| Increase, 4 mos., 1913 | 2,670 |

### Inverness Railway and Coal Co.

| | |
|---|---|
| Shipments, April, 1913 | 23,361 |
| Shipments, April, 1912 | 21.970 |
| Increase, April, 1913 | 1,391 |
| Shipments, 4 mos., 1913 | 82,585 |
| Shipments, 4 mos., 1912 | 82,918 |
| Decrease, 4 mos., 1913 | 333 |

### Intercolonial Coal Co.

| | |
|---|---|
| Shipments, April, 1913 | 12,643 |
| Shipments, April, 1912 | 16,476 |
| Decrease, April, 1913 | 3,833 |
| Shipments, 4 mos., 1913 | 50,706 |
| Shipments, 4 mos., 1912 | 71,687 |
| Decrease, 4 mos., 1913 | 20,981 |

## COBALT ORE SHIPMENTS.

The shipments for the week ending May 17, 1913, are as follows:

| Mine. | High. | Low. | Pounds. |
|---|---|---|---|
| Buffalo | 1 | .. | 65,900 |
| Penn Canadian | 1 | .. | 50,900 |
| McKinley-Darragh | 1 | .. | 303,360 |
| Cobalt Lake | 1 | .. | 63,686 |
| La Rose | 1 | .. | 85,775 |
| York, Ont. | 1 | .. | 40,000 |
| O'Brien | 1 | .. | 64.930 |
| Nipissing | .. | 2 | 127,129 |
| Cobalt Townsite | 1 | .. | 81,732 |
| Dom. Red. | 1 | .. | 84.000 |
| Kerr Lake | 1 | .. | 60.290 |
| | 13 | 2 | 1,027,702 |

The shipments from the Cobalt mines to date are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Coniagas | 21 | .. | 682.20 |
| Trethewey | 5 | 5 | 277.77 |
| Nipissing | 2 | 25 | 828.19 |
| Dom. Red. | 8 | .. | 267.81 |
| Hudson Bay | 7 | .. | 231.83 |
| Con. Townsite | 23 | .. | 835.92 |
| McKinley-Darragh | 28 | .. | 974.62 |
| Kerr Lake | 9 | .. | 325.28 |
| Beaver | 5 | .. | 135.98 |
| La Rose | 25 | 1 | 1048.12 |
| Peterson Lake (Seneca-Sup.) | 3 | 3 | 220.40 |
| Temiskaming | 8 | 1 | 278.61 |
| Crown Reserve | 5 | .. | 249.95 |
| Chambers-Ferland | 1 | 4 | 159.20 |
| Colonial | 1 | .. | 21.56 |
| Cobalt Lake | 9 | .. | 173.36 |
| Penn Canadian | 2 | .. | 57.51 |
| Drummond | 8 | .. | 219.59 |
| General Mines | .. | 0 | 8.80 |
| O'Brien | 5 | .. | 189.21 |
| Silver Queen | .. | .. | 60.34 |
| Bailey | 3 | 1 | 182.15 |
| Casey Cobalt | 3 | .. | 109.72 |
| Right of Way | .. | 2 | 62.19 |
| City of Cobalt | 3 | .. | 109.50 |

| | | | |
|---|---|---|---|
| Silver Bar | 1 | .. | 20.00 |
| York, Ont. | 1 | .. | 20.00 |
| Buffalo | 1 | .. | 32.95 |
| | 183 | 50 | 15,445.51 |

The bullion shippers this week were:

| Mine. | Bars. | Ounces. | Values. |
|---|---|---|---|
| Nipissing | 52 | 63.303.64 | $38.298.70 |
| Bank of Com. | 6 | 4.363.60 | 2,700.00 |
| C. and Deyell | 6 | 4,169.00 | 2.501.40 |
| | 54 | 72.836.24 | $43,499.10 |

The bullion shipments to date are:—

| Mine. | Ounces. | Value. |
|---|---|---|
| Nipissing | 1,902.892.80 | $1.103.342.94 |
| Bank of Com. | 4.363.60 | 2.700.00 |
| C. and Deyell | 4.169.00 | 2.501.40 |
| Buffalo | 538.584.50 | 354,308.76 |
| Crown Reserve | 146.491.00 | 95.054.00 |
| Dom. Red. | 206.284.40 | 117,410.55 |
| Townsite | 10.909.00 | 6.647.00 |
| Miscel. | 3.920.00 | 1.623.00 |
| Temiskaming | 5.970.50 | 3.434.50 |
| O'Brien | 42.547.77 | 24.914.40 |
| Wettlaufer | 4.715.00 | 2,925.00 |
| Miller Lake | 1.734.20 | 970.15 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 5.007.00 | 3.223.00 |
| Casey Cobalt | 2.394.00 | 1,520.00 |
| Kerr Lake | 7.300.71 | 4.894.35 |
| | 2.886.017.48 | $1.725.842.05 |

## B. C. ORE SHIPMENTS.

Ore production in the Kootenay and Boundary districts last week totalled 53.462 tons, surpassing the high figure of two weeks ago. For the year to date the total is 933.231 tons. Smelter receipts for the week ending May 10. 1913, were 47,393 tons and for the year to date 822.727 tons. Ore production in detail:

**Nelson.**

| | Week. | Year. |
|---|---|---|
| Yankee Girl | 38 | 1.558 |
| Molly Gibson | 2 | 178 |
| Queen | 37 | 210 |
| Queen, milled | 350 | 4.025 |
| Mother Lode, milled | 500 | 9,500 |
| Second Relief, milled | 200 | 3.200 |
| Queen Victoria | 826 | 10,434 |
| Otehr mines | | 5.747 |
| Total | 1.953 | 34.852 |

**Rossland.**

| | | |
|---|---|---|
| Centre Star | 2,794 | 53,674 |
| Le Roi | 993 | 22.552 |
| Le Roi No. 2 | 374 | 8.172 |
| Le Roi No. 2, milled | 350 | 6.650 |
| Other mines | | 179 |
| Total | 4.511 | 91,227 |

**East Kootenay.**

| | | |
|---|---|---|
| Sullivan | 745 | 14,213 |
| St. Eugene | 138 | 620 |
| Total | 883 | 13,839 |

**Lardeau.**

| | | |
|---|---|---|
| Other mines | | 137 |

**Slocan and Ainsworth.**

| | | |
|---|---|---|
| Standard, milled | 500 | 9.500 |
| Van-Roi, milled | 725 | 11.983 |
| Bluebell, milled | 1.200 | 22,600 |
| Rambler-Cariboo, milled | 300 | 5,700 |
| Standard | 379 | 5,766 |
| Bluebell | 198 | 3.078 |
| Rambler-Cariboo | 83 | 1,138 |
| Silver Hoard | 82 | 336 |
| No. 1 | 162 | 925 |
| Other mines | | 3,097 |
| Total | 3.720 | 66,023 |

**Boundary.**

| | | |
|---|---|---|
| Nickle Plate, milled | 1.500 | 28.500 |
| Ben Hur | 545 | 3,788 |
| United Copper | 35 | 1,600 |
| No. 7 | 392 | 2.674 |
| Granby | 27,108 | 447.026 |
| Mother Lode | 6.450 | 123.780 |
| Rawhide | 5.363 | 96,515 |
| Napoleon | 560 | 14.112 |
| Unnamed | 89 | 2.080 |
| Other mines | | 4.297 |
| Total | 42.042 | 724.372 |

**Zinc Shipments.**

| | | |
|---|---|---|
| Van Roi | 62 | 428 |
| Standard | 282 | 998 |
| Other mines | | 355 |
| Total | 344 | 1,781 |

**Consolidated Co.'s Receipts—Trail, B.C.**

| | | |
|---|---|---|
| Ben Hur | 545 | 3,788 |
| United Copper | 35 | 1,600 |
| No. 7 | 392 | 2,674 |
| Standard | 379 | 5,766 |
| Bluebell | 198 | 3.078 |
| Rambler-Cariboo | 83 | 1,138 |
| Silver Hoard | 82 | 336 |
| No. 1 | 162 | 925 |
| Yankee Girl | 38 | 1,558 |
| Molly Gibson | 2 | 178 |
| Queen | 37 | 210 |
| Centre Star | 2.794 | 53.674 |
| Le Roi | 993 | 22.552 |
| Le Roi, No. 2 | 374 | 8.172 |
| Sullivan | 745 | 14.213 |
| St. Eugene | 138 | 626 |
| Other mines | | 8.302 |
| Total | 6.997 | 128.780 |

**Granby Smelter Receipts—Grand Forks, B.C.**

| | | |
|---|---|---|
| Granby | 27,108 | 447.026 |

**B. C. Copper Co.'s Receipts—Greenwood, B.C.**

| | | |
|---|---|---|
| Mother Lode | 6.450 | 123,780 |
| Rawhide | 5.363 | 96.515 |
| Napoleon | 560 | 14.112 |
| Queen Victoria | 826 | 10,434 |
| Unnamed | 89 | 2.080 |
| Total | 13.288 | 246.921 |

## STOCK MARKETS

(Courtesy of J. P. Bickell Co., Standard Bank Building, Toronto, Ont.)

May 20th, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 3.25 | 3.50 |
| Giroux Copper | 1.87½ | 2.00 |
| Greene Cananea | 6.62½ | 6.87½ |
| Rays Cons. | 17.75 | 18.00 |
| Miami Copper | 22.50 | 23.00 |
| Nevada Cons. | 16.37½ | 16.50 |
| Tonapah Mining | 5.50 | 5.62½ |
| Tonopah Belmont | 6.12½ | 6.37½ |
| Goldfield Con. | 1.87½ | 2.00 |
| Standard Oil of N.J. | 355.00 | *360.00 |
| Standard Oil New | ...... | ...... |
| Standard Oil Subs | 700.00 | 800.00 |
| Braden Copper | 7.62½ | 7.75 |

*Ex di 5 per cent.

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey. | .09 | .09¼ |
| Beaver. | .36 | .37 |
| Buffalo | 2.00 | 2.40 |
| Canadian G. & S. | .23 | .24 |
| Chambers-Ferland. | .21 | .23 |
| City of Cobalt | .47 | .51 |
| Cobalt Lake | .68 | .72 |
| Coniagas. | 7.85 | 8.05 |
| Crown Reserve | 3.80 | 3.90 |
| Foster. | .08 | .10 |
| Gifford. | .05 | .06 |
| Great Northern. | .14¼ | .15 |
| Green Meehan. | .00¾ | .01 |
| Hargraves. | .05 | .06 |
| Hudson Bay | 65.00 | 70.00 |
| Kerr Lake | 3.20 | 3.30 |
| La Rose. | 2.43 | 2.48 |
| McKinley-Darragh. | 1.86 | 1.88 |
| Nipissing. | 8.90 | 9.05 |
| Ophir. | .03 | .05 |
| Peterson Lake | .23¼ | .24 |
| Rochester. | .03½ | .04 |
| Right of Way | .05 | .06 |
| Silver Leaf | .03½ | .04 |
| Silver Queen | .04½ | .06 |
| Temiskaming. | .34½ | .36 |
| Trethewey. | .32 | .34 |
| Wettlaufer. | .13½ | .14 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex. | .01 | .02 |
| Crown Chartered | .00¾ | .01 |
| Dome Extension | .07 | .07½ |
| Dome Lake | 2.30 | 2.40 |
| Foley-O'Brien | .27 | .30 |
| Hollinger. | 17.50 | 18.00 |
| Jupiter. | .46 | .48 |
| McIntyre | 3.05 | 3.50 |
| Moneta. | .05 | .06 |
| North Dome | .50 | .60 |
| Porcupine Gold | .17 | .18½ |
| Porcupine Imperial | .03 | .03½ |
| Porcupine Tisdale | .01 | .02 |
| Porcupine Reserve | .10 | .14 |
| Pearl Lake. | .54 | .55 |
| Preston E. D. | .03 | .03½ |
| Rea Mines. | .25 | .35 |
| Swastika. | .06½ | .07 |
| West Dome | .20 | .24 |

### Sundry.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 5.00 | 5.25 |
| Canadian Marconi | 3.00 | 4.00 |
| Island Smelters | .00¾ | .01 |

### TORONTO MARKETS.

May 26—(Quotations from Canada Metal Co., Toronto).
Spelter, 6¼ cents per pound.
Lead, 5¼ cents per pound.
Tin, 52 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 11 to 15 cents per pound.

May 26—Pig iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, \$26.00 ,f.o.b. Toronto).
Summerlee No. 2, \$25.00 (f.o.b. Toronto).
Midland No. 1, \$20.00 to \$20.50 (f.o.b. Toronto).
Midland No. 2, \$20.00 to \$20.50 (f.o.b. Toronto).

### GENERAL MARKETS.

Coal, anthracite, \$5.50 to \$6.75 per ton.
Coal, bituminous, \$3.50 to \$4.50 for 1¼-inch lump.

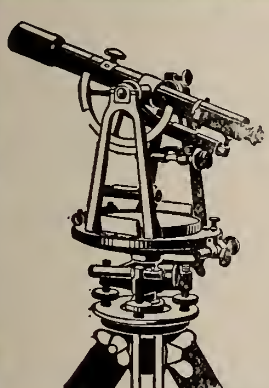
### Coke.

May 21—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, \$2.15 to \$2.25 per ton.
Foundry coke, prompt, \$2.85 to \$3.25 per ton.

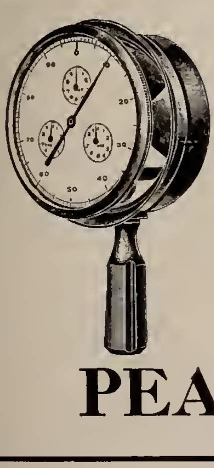
May 21—Tin, straits, 48.40 cents.
Copper, Prime Lake, 15.70 to 15.80 cents.
Eelctrolytic copper, 15.60 to 15.70 cents.
Copper wire, 17.00 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.40 to 5.50 cents.
Sheet zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.70 cents.
Aluminium, 25.25 to 26.25 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, \$46.00 per ounce.
Platinum, hard, \$51.00 per ounce.
Bismuth, \$2.00 to \$2.25 per pound.
Quicksilver, \$39.00 per 75-lb. flask.

### SILVER PRICES.

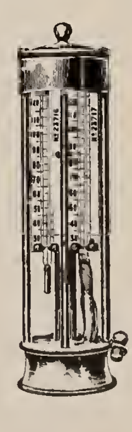
| | New York cents | London pence |
|---|---|---|
| May 10 | 60⅝ | 28 |
| " 12 | 60⅝ | .. |
| " 13 | 61 | 28 3/16 |
| " 14 | 61 | 28⅛ |
| " 15 | 61 | 28⅛ |
| " 16 | 60⅞ | 28 1/16 |
| " 17 | 60¾ | 28 |
| " 19 | 60⅞ | 28 1/16 |
| " 20 | 60⅞ | 28 1/16 |
| " 21 | 60⅝ | 27 15/16 |











# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Demorest, Stull & Low
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Forbes, S. H. L.
Forbes, H. L.
Graham, S. N.
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Ledoux & Co.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

# BUYERS AND SELLERS OF METALS

# PROVINCE OF QUEBEC

**Department of Colonization, Mines, and Fisheries**

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
**HALIFAX, N. S.**

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Fraser & Chalmers, Ltd.
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Campbell & Deyell, Cobalt Ont.
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Thos Hayes & Son, 124 Yonge St. Toronto.

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C. L. Berger & Sons, 37 William St., Boston, Mass.
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Mussens, Limited.

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Waterous Engine Works.
Jenckes Machine Co.
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Mussens, Limited.

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Peacock Bros.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock, Ltd.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.

**Engines—Haulage—**
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
The John Inglis Co., Ltd.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.

**Engines—Steam—**
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock, Ltd.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
John McDonald Caledonian Iron Works, Ltd.

**Excavators—**
Jeffrey Mfg. Co.
Mussens, Limited.

**Fans—Ventilating—**
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Allis-Chalmers-Bullock, Ltd.
Mussens, Limited.

**Feeders—Ore—**
Fraser & Chalmers, Ltd.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

**Filters—**
John McDougall Caledonian Iron Works.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

**Forgings—**
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

**Furnaces—Assay—**
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Northern Canada Supply Co.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

- Smart-Turner Machine Co.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Generators—**
- Allis-Chalmers-Bullock, Ltd.
- Canadian Westinghouse.
- Peacock Brothers.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Can., Ltd.

**Galvanized Strand—**
- B. Greenings Wire Co., Ltd.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Girders—Steel—**
- Dominion Bridge Co.

**Hangers—Cable—**
- Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
- Mussens, Limited.
- Laurie & Lamb.
- E. Leonard & Sons.
- Canadian Westinghouse.
- Peacock Bros.
- Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
- Mussens, Limited.
- Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
- Can. Ingersoll-Rand Co., Ltd.
- Peacock Bros.
- Mussens, Limited.
- Allis-Chalmers-Bullock, Ltd.
- S. Flory Mfg. Co.
- Jones & Glassco.
- Waterous Engine Works.
- Jeckes Machine Co., Ltd.
- M. Beatty & Sons.
- Jeffrey Mfg. Co.
- Canada Foundry.
- Can. Fairbanks-Morse Co.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Hoisting Engines—**
- Mussens, Limited.
- E. Leonard & Sons.
- Allis-Chalmers-Bullock.
- Peacock Bros.
- Canada Foundry Co.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Can., Ltd.
- Sullivan Machinery Co.
- Fraser & Chalmers, Ltd.
- Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
- Mussens, Limited.
- Waterous Engine Works.

**Hose—**
- H. W. Johns-Manville Co.
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- Can. Ingersoll-Rand Co., Ltd.
- Can. Cleveland Drill Co.
- Northern Canada Supply Co.

**Injectors—**
- Mussens, Limited.
- Northern Canada Supply Co.
- Peacock Bros.

**Jacks—**
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- Canadian Ingersoll-Rand Co., Ltd.
- Northern Canada Supply Co.

**Jigs—**
- Mussens, Limited.
- Allis-Chalmers-Bullock.
- Jenckes Machine Co.

**Lamps—Acetylene—**
- Mussens, Limited.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Lamps—Safety—**
- Canadian Explosives.
- John Davis & Son.
- Peacock Bros.
- Ackroyd & Best.
- Siemens Co. of Can., Ltd.

**Levels and Rules—**
- Northern Canada Supply Co.

**Link Belt—**
- Waterous Engine Works.
- Northern Canada Supply Co.
- Jones & Glassco.

**Locomotives—Compressed Air—**
- Mussens, Limited.
- Canadian Westinghouse.

**Locomotives—Electric—**
- Mussens, Limited.
- Jeffrey Mfg. Co.
- Canadian Westinghouse.
- Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
- Mussens, Limited.
- Canadian Westinghouse.

**Metal Merchants—**
- Henry Bath & Son.
- Geo. G. Blackwell Sons & Co.
- Consolidated Mining & Smelting Co. of Canada.
- Canada Metal Co.

**Monel Metal—**
- Orford Copper Co.

**Motors—**
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- Jeffrey Mfg. Co.
- Canadian Westinghouse.
- Peacock Brothers.
- Jones & Moore.
- Siemens Co. of Can., Ltd.
- Allis-Chalmers-Bullock, Ltd.

**Ore Sacks—**
- Can. Bag Co.
- Can. Fairbanks-Morse Co.
- Northern Canada Supply Co.

**Ore Testing Works—**
- Ledoux & Co.
- Can. Laboratories.
- Milton Hersey Co., Ltd.
- Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
- Geo. G. Blackwell.
- Consolidated Mining & Smelting Co. of Canada.
- Orford Copper Co.
- Canada Metal Co.

**Perforated Metals—**
- B. Greening Wire Co., Ltd.
- Allis-Chalmers-Bullock.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Pick Machines—**
- Sullivan Machinery Co.
- Hardy Patent Pick.

**Picks—Steel—**
- Mussens, Limited.
- Hardy Patent Pick.
- Northern Canada Supply Co.
- Thos. & Wm. Smith.
- Peacock Bros.

**Pipes—Rivetted—**
- John McDougall Caledonian Iron Works.
- Consolidated Mining & Smelting Co.
- Peacock Bros.
- Laurie & Lamb.
- E. Leonard & Sons.
- Jeffrey Mfg. Co.
- Can. Fairbanks-Morse Co.
- Mussens, Limited.
- Northern Canada Supply Co.
- Smart-Turner Machine Co.
- The John Inglis Co., Ltd.

**Pipe Fittings—**
- Can. H. W. Johns-Manville.
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- Canadian Westinghouse.
- Northern Canada Supply Co.

**Pneumatic Tools—**
- Can. Cleveland Drill Co.
- Can. Ingersoll-Rand Co., Ltd.
- Peacock Brothers.
- Jones & Glassco.

**Producer—Gas—**
- Mussens, Limited.
- E. Leonard & Sons.

**Prospecting Mills and Machinery—**
- Standard Diamond Drill Co.
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- American Diamond Rock Drill.
- Allis-Chalmers-Bullock, Ltd.
- Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
- E. Leonard & Sons.
- Smart-Turner Machine Co.
- Jeffrey Mfg. Co.
- John McDougall Caledonian Iron Works, Ltd.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Pielsometers—**
- Mussens, Limited.
- Can. Fairbanks-Morse Co.

**Pumps—Boiler Feed—**
- Mussens, Limited.
- E. Leonard & Sons.
- Northern Canada Supply Co.
- Smart-Turner Machine Co.
- Peacock Bros.
- Laurie & Lamb.
- Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
- Alex. Fleck.
- Mussens, Limited.
- E. Leonard & Sons.
- Allis-Chalmers-Bullock.
- John McDougall Caledonian Iron Works.
- Smart-Turner Machine Co.
- Peacock Bros.
- Thos. & Wm. Smith.
- M. Beatty & Sons.
- Can. Ingersoll-Rand Co., Ltd.
- Laurie & Lamb.
- Fraser & Chalmers, Ltd.
- The John Inglis Co., Ltd.

**Pumps—Electric—**
- E. Leonard & Sons.
- Mussens, Limited.
- Jeffrey Mfg. Co.
- Allis-Chalmers-Bullock, Ltd.
- John McDougall Caledonian Iron Works, Ltd.
- Fraser & Chalmers, Ltd.
- The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
- E. Leonard & Sons.
- Mussens, Limited.
- Smart-Turner Machine Co.
- Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
- E. Leonard & Sons.

**Pumps—Sinking—**
- Mussens, Limited.
- E. Leonard & Sons.
- John McDougall Caledonian Iron Works, Ltd.
- Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
- Canadian Ingersoll-Rand Co., Ltd.
- Mussens, Limited.
- Thos. & Wm. Smith.
- E. Leonard & Sons.
- Northern Canada Supply Co.
- John McDougall Caledonian Iron Works.
- Can. Fairbanks-Morse Co.
- Smart-Turner Machine Co.
- Alex. Fleck.
- The John Inglis Co., Ltd.

**Pumps—Turbine—**
- Mussens, Limited.
- E. Leonard & Sons.
- Smart-Turner Machine Co.
- Canada Foundry Co.
- John McDougall Caledonian Iron Works, Ltd.
- Fraser & Chalmers, Ltd.
- The John Inglis Co., Ltd.

**Pumps—Vacuum—**
- E. Leonard & Sons.
- Smart-Turner Machine Co.

**Quarrying Machinery—**
- Can. Cleveland Drill Co.
- Sullivan Machinery Co.
- Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
- Allis-Chalmers-Bullock.
- Fraser & Chalmers, Ltd.

**Rolling Mill Machinery—**
- Fried, Krupp A.-G. Grusonwerk.

**Rolls—Crushing—**
- Mussens, Limited.
- Fraser & Chalmers, Ltd.
- Allis-Chalmers-Bullock.

**Roofing—**
- Paterson Mfg. Co.
- Dominion Bridge Co.
- Mussens, Limited.
- Northern Canada Supply Co.
- Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
- Jones & Glassco.
- Mussens, Limited.
- Allis-Chambers-Bullock.
- Peacock Bros.
- Northern Canada Supply Co.
- Allan, Whyte & Co.
- Thos & Wm. Smith, Ltd.

**Rope—Wire—**
- B. Greening Wire Co.
- Allan, Whyte & Co.
- Northern Canada Supply Co.
- Thos. & Wm. Smith, Ltd.
- Fraser & Chalmers, Ltd.

**Samplers—**
- Canadian Laboratories.
- Ledoux & Co.
- Milton Hersey Co.
- Thos. Heys & Sons.

**Scales—**
- Can. Fairbanks-Morse Co.
- Peacock Bros.
- Northern Canada Supply Co.
- Thos. & Wm. Smith.

**Screens—**
- Mussens, Limited.
- Jeffrey Mfg. Co.
- Can. Fairbanks-Morse Co.
- Jenckes Machine Co.
- Northern Canada Supply Co.
- B. Greening Wire Co.
- Allis-Chalmers-Bullock.
- Peacock Bros.
- Waterous Engine Co.
- Chalmers & Williams.
- Fraser & Chalmers, Ltd.

**Separators—**
- E. Leonard & Sons.
- Canada Foundry Co., Ltd.
- Wethcrell Magnetic Separating Co.
- Smart-Turner Machine Co.
- Peacock Brothers.
- The John Inglis Co., Ltd.

**Separators—Magnetic—**
- American Grondal Co.
- Wetherill Magnetic Separating Co.

**Shovels—Steam—**
- Mussens, Limited.
- M. Beatty & Sons.

**Slime Tables—**
- Deister Concentrator Co.
- James Ore Concentrator.
- Canada Foundry.
- Chalmers & Williams.

**Smelting Machinery—**
- Mussens, Limited.
- Allis-Chalmers-Bullock.
- Peacock Brothers.
- Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
- Consolidated Mining & Smelting Co.

**Stamp Mills—**
- Mussens, Limited.
- Allis-Chalmers-Bullock.
- Can. Fairbanks-Morse Co.
- Jenckes Machine Co.
- Peacock Brothers.
- Canada Foundry.
- Fraser & Chalmers, Ltd.

**Steel Drill—**
- Sullivan Machinery Co.
- Northern Canada Supply Co.
- Canadian Ingersoll-Rand Co., Ltd.
- Peacock Bros.

**Steel—Tool—**
- Mussens, Limited.
- Thos. & Wm. Smith.
- Can. Fairbank-Morse Co.
- Northern Canada Supply Co.
- N. S. Steel & Coal Co.

**Steel—Structural—**
- Dominion Bridge Co.

**Surveying Instruments—**
- Peacock Brothers.
- W. F. Stanley.
- C. L. Berger.
- Jno. Davis & Son.

**Switchboards—**
- Canadian Westinghouse.
- Allis-Chalmers-Bullock.
- Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
- Mussens, Limited.
- E. Leonard & Sons.
- John McDougall Caledonian Iron Works.
- Peacock Bros.
- Fraser & Chalmers, Ltd.
- The John Inglis Co., Ltd.

**Terminals—Cable—**
- Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
- Mussens, Limited.
- B. Greening Wire Co.
- Allis-Chalmers-Bullock.
- Jenckes Machine Co.

**Transformers—**
- Allis-Chalmers-Bullock.
- Canadian Westinghouse.
- Can. Fairbanks-Morse Co.
- Peacock Bros.
- Siemens Co. of Can., Ltd.

**Transits—**
- C. L. Berger & Sons.
- W. F. Stanley.
- John Davis & Son.
- Peacock Bros.

**Tube Mills—**
- Mussens, Limited.
- Allis-Chalmers-Bullock.
- Peacock Bros.
- Canada Foundry.
- Fraser & Chalmers, Ltd.

**Turbines—**
- Allis-Chalmers-Bullock.
- Canada Westinghouse.
- Peacock Bros.
- Laurie & Lamb.
- Canada Foundry.
- Jenckes Machine Co.
- Siemens Co. of Can., Ltd.
- John McDougall Caledonian Iron Works, Ltd.
- Fraser & Chalmers, Ltd.
- International Engineering Works, Ltd.

**Water Wheels—**
- Allis-Chalmers-Bullock.
- John McDougall Caledonian Iron Works.
- Jenckes Machine Co.

**Wheels—**
- Mussens, Limited.
- Jeffrey Mfg. Co.

**Winding Engines—**
- Waterous Engine Works.
- Mussens, Limited.
- Canada Foundry Co.
- Allis-Chalmers-Bullock.
- Jenckes Machine Co.
- Peacock Brothers.
- Can. Ingersoll-Rand Co., Ltd.
- Fraser & Chalmers, Ltd.
- E. Leonard & Sons.
- Siemens Co. of Can., Ltd.

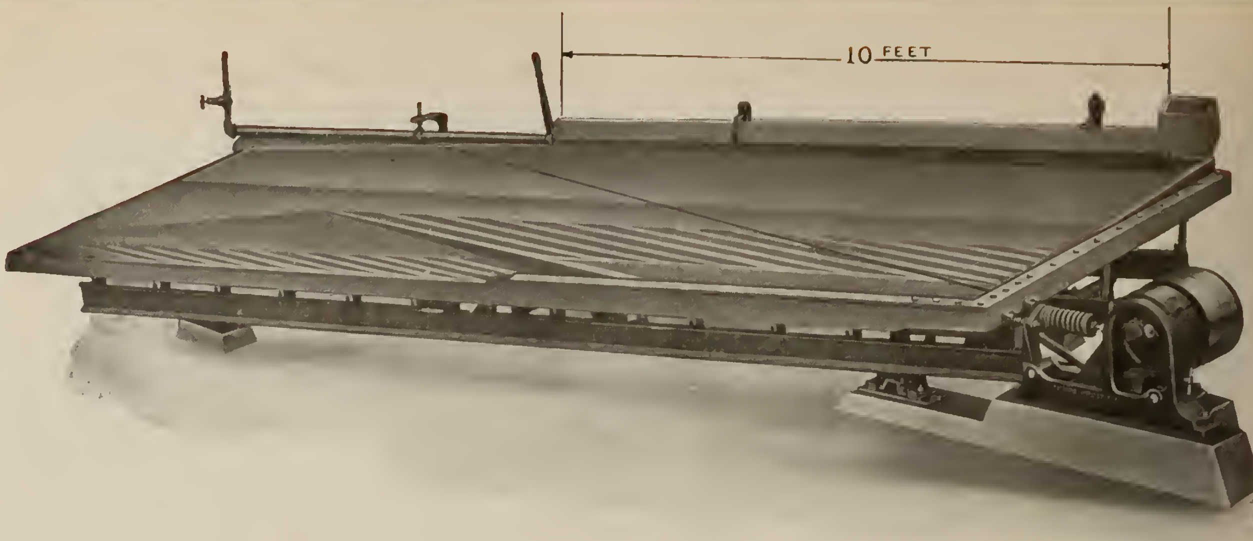
**Wire Cloth—**
- Mussens, Limited.
- Northern Canada Supply Co.
- B. Greening Wire Co.

**Wire (Bare and Insulated)—**
- Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
- Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
- Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
- Roessler & Hasslacher.

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VOL. XXXIV TORONTO No. 13



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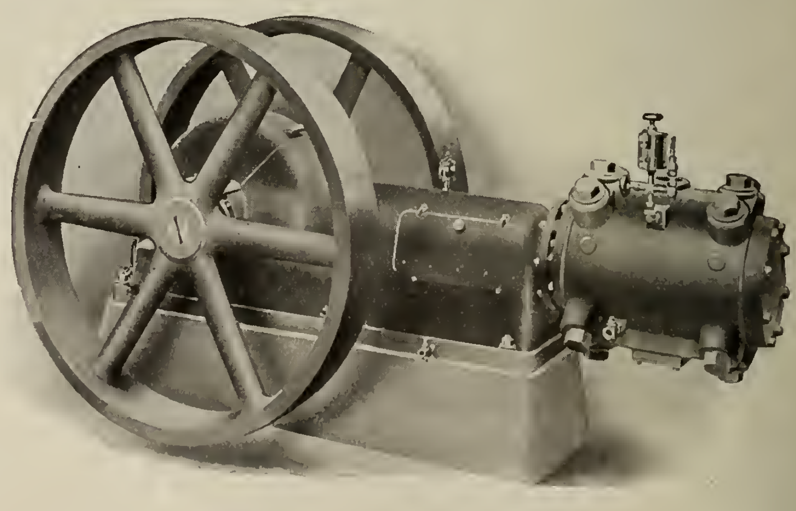

*The Bulletin is No. 658 N.*

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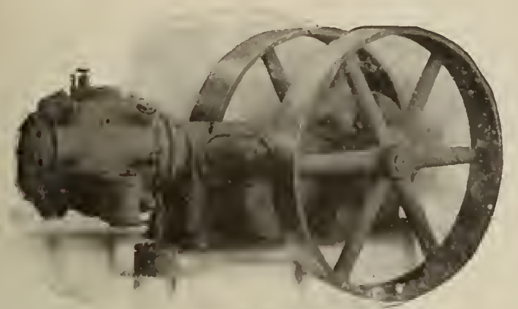
*Efficient application of compressed air is only procured through the use of efficient means of compression—a high grade compressor.*

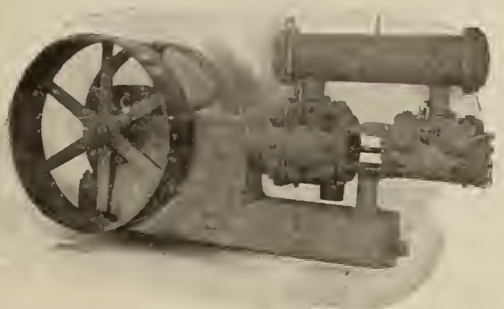


Class "NE-1" Single Stage, Belt Driven Compressor described in Catalogue K-92.

*The machines illustrated on this page are types of our Class "N" compressors.*

*While these compressors are compact in their construction they have a greater capacity per foot of floor space than any corresponding type on the market.*

*Every detail about these machines is the result of a predetermined standard of quality—that is, high capacity in a restricted space.*



Class "NE-2" Two Stage, Belt Driven Compressor. Details in Catalogue K-99.

*The sub-base extending under the entire machine, is well ribbed, and has flanges with wide bearings on the foundation.*

*The frame is strongly and adequately reinforced.*

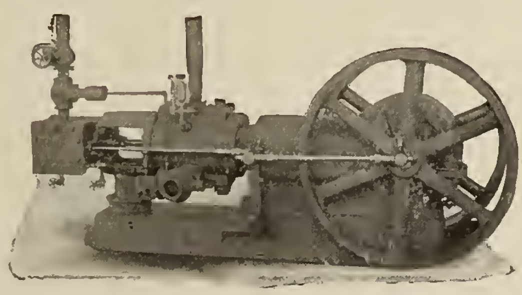
*Bearings are extremely well proportioned consistent with the speed accorded these machines.*

*Valve ports and passages are designed to convey the full rated capacity without undue rise in temperature.*

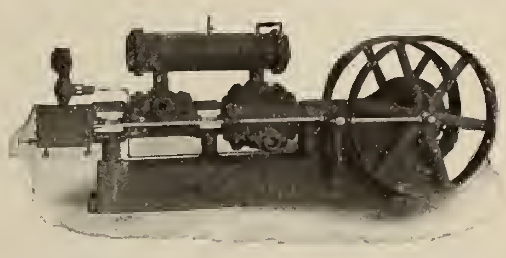
*The cooling surfaces are large and air cylinders are completely water-jacketed.*

*The automatic flood lubrication is a distinct feature of these compressors, keeping all bearings and wearing surfaces constantly bathed in oil.*

*Both single and two stage machines, for either steam or belt drive, with capacities ranging from 57 to 426 cubic feet of free air per minute at pressures from 15 to 100 pounds are included in this class.*



Class "NF-1" Single Stage, Steam Driven Compressor. For Description see Catalogue K-96.



Class "NF-2" Two Stage, Steam Driven Compressor. Covered by Catalogue K-98.

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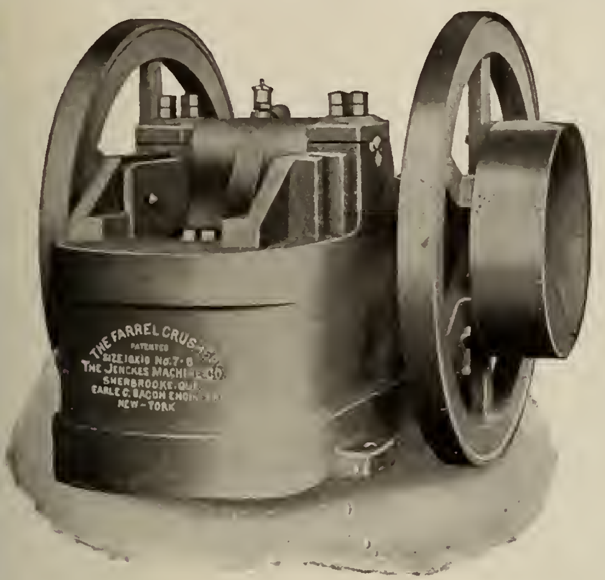

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# Farrel Rock Crusher

STYLE "B"

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**Especially suitable for crushing stone for macadam and concrete work.**

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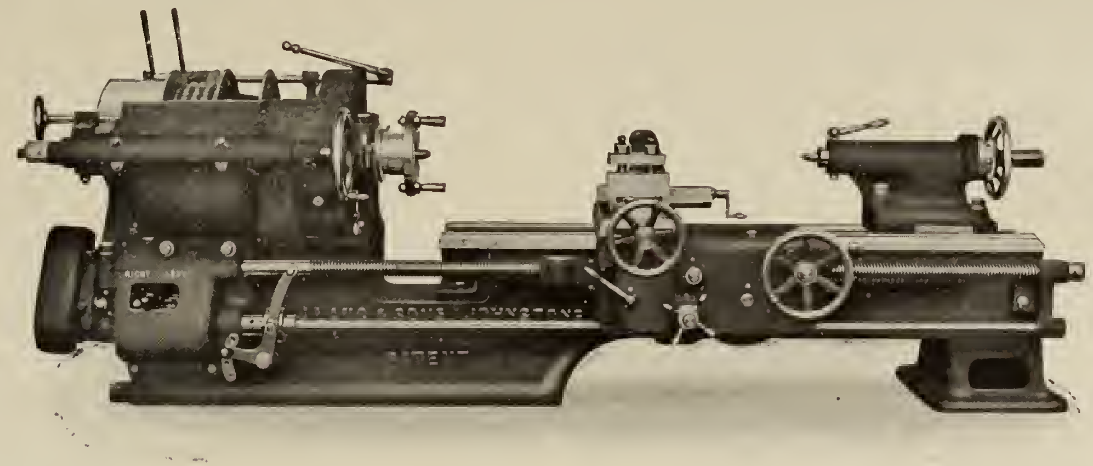

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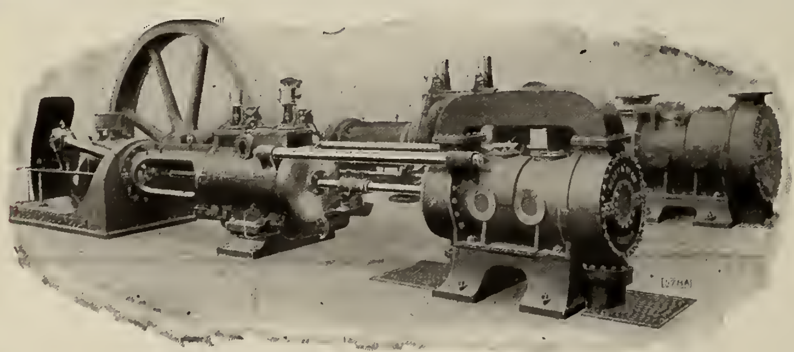

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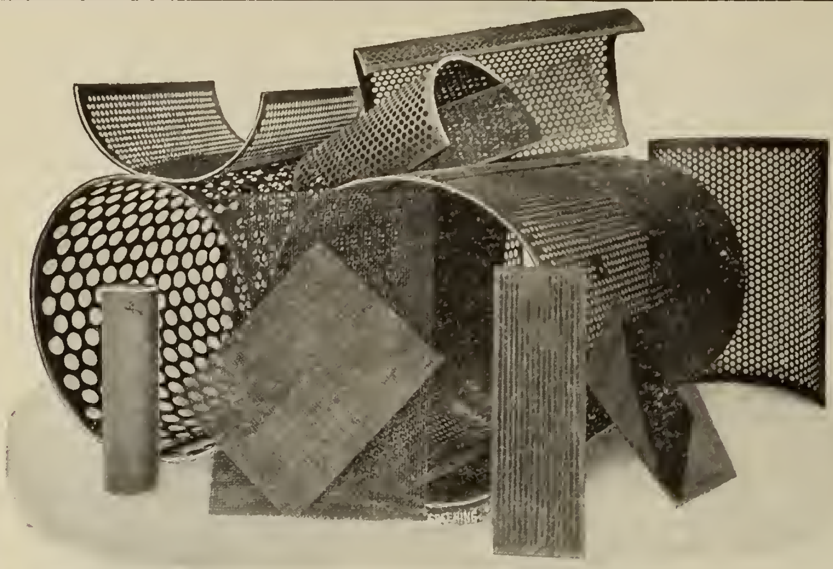

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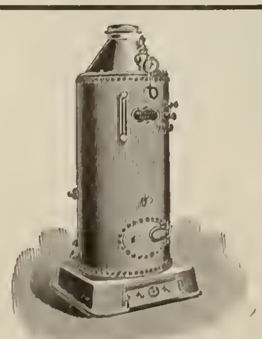

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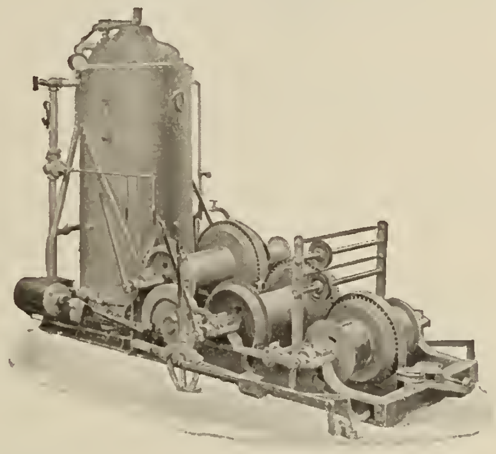

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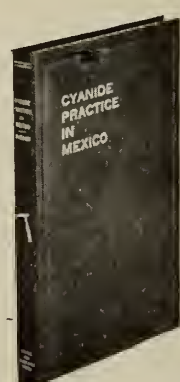


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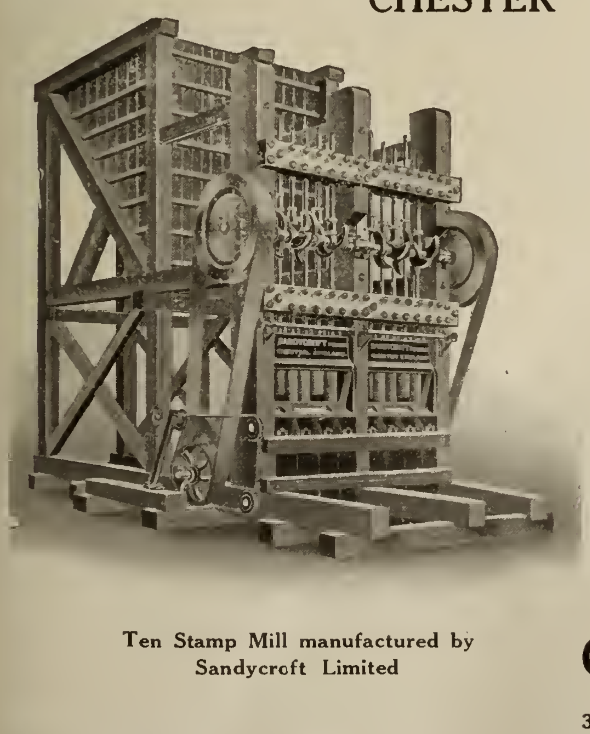

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, July 1, 1913. No. 13

## The Canadian Mining Journal

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879.'

CONTENTS.



## PRESENT CONDITION OF COBALT MINES

Cobalt has made a remarkable record since its discovery, and promises to be an important producer of silver for many years to come. In the years 1904 to 1912, inclusive, the district produced 155,832,615, ounces of silver valued at over $80,000,000, and made a profit to the mine owners of over one-half of the value of the silver. The output is not only large, but the cost per ounce has been remarkably low, and the industry consequently an unusually profitable one.

The great profit has been made possible by the richness of the ore. To treat low grade ore several mills were built and are proving of great value. The profit being made is still largely from high grade ore; but the concentrators have each year contributed a larger percentage of the output. During the last two years a further advance has been made in treating the high grade ore at Cobalt, instead of shipping it to smelters. This process, worked out and now in operation at the Nipissing mine, gives a high recovery and yields a product of refined silver ready for the mint. A similar process is now in use at the Buffalo mine.

In mining the low grade ore to supply the mills it has been found that the number of high grade veins is more numerous than was expected. It is a common occurrence to break into narrow veins of rich ore a few feet from the openings which were made in following another vein. It has been found that in places where the high grade veins split up into stringers or apparently pinched out, the silver is distributed over a much greater width. Usually a large tonnage of milling ore occurs in such places.

The present condition of the mines indicates clearly that there is still a large quantity of high grade ore to be mined from veins already opened up, and that the mining of low grade ore must be expected to uncover many more small but rich veins. There is, as yet, no satisfactory evidence that the mines will prove profitable at great depth; but there is no doubt whatever that the tonnage of low grade ore to be mined within a few hundred feet of the surface is enormously large. As high grade ore fails, the profits will necessarily fall off. A comparatively small, but still handsome profit per ounce, will be made from the much larger tonnage of low grade ore, if the cost per ton can be kept at a reasonable figure. At present, owing to the nature, of the deposits, the costs are high and there is some ground to fear that the cost next year will be higher instead of lower.

Nearly all the mines which have ever been worked profitably are still making money, and there are a few which have only just this last year begun to earn dividends. Some of the mines have doubtless seen their best days, for the bonanza veins have been pretty well worked out; but even these will be important producers and have unexplored territory in which there is a reasonable chance that more ore will be found. In the mines which still have considerable quantities of high grade ore in sight, a large percentage of the definitely known ore has been taken out, and it is not likely that an equal quantity of such bonanza ore will be found. Some ore of equal richness and a large quantity of lower grade ore is, however, almost certain to be discovered as development proceeds.

Among mines which are certain to produce a large tonnage of high grade ore, Nipissing, Coniagas, and Crown Reserve are in remarkably good condition. Three mines, Townsite, Cobalt Lake and Casey Cobalt have only recently become important producers, and may be expected to figure more largely in future shipments. The Drummond mine has been re-opened with satisfactory results, and the Seneca-Superior has made several shipments of rich ore from a vein discovered only last summer.

With improved methods of mining, careful sorting and jigging of the ore as it is brought from the mine, treatment of high grade ore by the amalgamation-cyanide process, and of low grade ore by straight concentration and of slime tails by cyanidation, a very satisfactory recovery of silver is made at a low cost. Without allowing for further improvements made as experience is gained, it is evident that 12-ounce ore, enclosing occasional small veins of high grade ore, can be profitably mined. With this assurance and a knowledge of present conditions, one may well hesitate to predict the life of Cobalt as a silver producer. In any case, a large production for several years is assured. The profit that will be made during this period will depend largely on the amount of high grade ore that is discovered during development. How long the process of exhaustion will take is beyond human ken. But, considering the past production and the present conditions, it is safe to assume that Cobalt will be producing silver for many years to come.

## SUDBURY, COBALT AND PORCUPINE GEOLOGY

In the June 7 issue of the Engineering and Mining Journal, New York, Dr. W. G. Miller and C. W. Knight discuss the geology of Ontario's three most important mining districts. As the authors state in their opening paragraphs, the pre-Cambrian areas south of Lake Superior have for several years been closely studied by a large number of geologists and engineers on account of their great deposits of iron and copper. Similar formations in Ontario are much less well known; but the discovery of nickel, silver and gold ores and the large production that has resulted from the development of such deposits, has shown the desirability of much closer study of the geology of Northern Ontario. At Sudbury, Cobalt, and Porcupine, much has been learned in the past few years. Some relationships between these districts are brought out by the authors.

Sudbury is the oldest and most important district, having produced about 167,000 tons of nickel and 107,000 tons of copper. Cobalt, though much younger than Sudbury, is, perhaps, more widely known. Since the first discovery, in 1903, the district has produced about 170,000,000 ounces silver, valued at about $90,000,000, and netting the mine owners about $50,000,000. During the past year, Cobalt produced about one-eighth the total yield of the world, making Canada as a source of silver second only to Mexico and United States. Porcupine is still younger, gold having been first found in important quantity there in 1909. Already, in spite of many serious handicaps, this district has assumed considerable importance, two large deposits and a few smaller ones having been developed to such an extent that a production of several million dollars is assured.

The nickel, silver and gold deposits of these three districts are very dissimilar. They belong to three distinct types. There are, however, some features in common and it is these features which the authors deal with.

"The ore deposits of all three of these areas are in rocks that are classified as of pre-Cambrian age. While the deposits differ greatly, both as regards form and mineral content, it is believed that all of them owe their origin to igneous intrusions. At Sudbury, the intrusive rock is quartz-norite, at Cobalt quartz-diabase, and at Porcupine, granite."

As the paper is a short one, the authors do not elaborate arguments to account for their belief as to the origin of the ores, but state briefly that:

"In the opinion of most observers who have studied them, the Sudbury ores, essentially a mixture of pyrrhotite and copper pyrites, are direct segregation deposits from the norite magma, but there may also have been some later deposition of ore minerals.

"The Cobalt ores, essentially arsenides of cobalt and nickel with native silver, are, like those of Sudbury, believed to be directly connected with intrusions of igneous rocks. Not only at Cobalt, but in the surrounding region, about 5,000 square miles in extent, the ores are associated with quartz-diabase in such a way as to lead to the belief that they were deposited from heated, impure waters that followed the diabase intrusion. Thus both the Sudbury and Cobalt ores may be considered as coming from molten magmas, the former by direct segregation with the intervention of little water, while those of Cobalt may be looked on as the end product of the diabase intrusion, deposition taking place from aqueous solution.

"While granite is not exposed at most of the Porcupine mines, it surrounds the gold area. The rocks in which the veins occur form what may be called a large island-like area upon the granite, which probably underlies most of the area. The presence of feldspar, tourmaline and scheelite in the quartz of the gold veins suggests a close connection between the veins and the granite intrusions.

"It is of interest to note that, at least, most of the silver at Cobalt and most of the gold at Porcupine was deposited in the veins after the latter had been fractured and disturbed. At Cobalt, the vein filling before the disturbance took place, consisted essentially of cobalt-nickel minerals and dolomite, and at Porcupine of quartz."

The greater part of the paper is devoted to a discussion of the several series of rocks occurring in the three districts. The Sudbury norite and the Cobalt diabase masses are compared, and age relationships of the several rock groups are stated.

"Although the triangle-shaped region that includes the three areas is 8,000 square miles in extent, there is a close resemblance of the rocks of one area to those of the others. Broadly speaking, there are five or six great groups of pre-Cambrian rocks in the region. Insofar as it is possible to correlate them, each of these groups, with the possible exception of the Animikie, of Sudbury, is present in each of the mining areas, although some are more prominent in one area than in the others, and vice versa."

In order of age the groups referred to are Keewatin, Laurentian granite and gneiss, Timiskaming series, Lorrain granite, Cobalt series, Nipissing diabase, dikes of aplite, diabase, etc. It is suggested by the authors that part of the rocks classed as Keewatin may be of the same age as the Grenville series of Eastern Ontario.

The authors suggest that the dual system of classification of the pre-Cambrian be discarded, because of the thickness of the Grenville series in Eastern Ontario.

The classification of the pre-Cambrian rocks of the Lake Superior states into Huronian and Archean was at one time understood to imply for each district a separation of sedimentary from igneous formations. By several members of the United States Geological Survey it was thought that this was the case; but it has now long been known by these same men that this view was erroneous. The Huronian in some of the iron mining districts is largely sedimentary; but in others it is largely igneous. It is none the less true, however, that there is a remarkable difference between the older or Archean group, including Keewatin and Laurentian, and the younger group known as the Huronian. The Huronian group has suffered much less deformation than the Archean. The Lake Superior geologists have not discarded the classification of the pre-Cambrian which has been long in use; but they no longer consider that the Archean is wholly igneous or the Huronian sedimentary. In some districts the Keewatin is largely sedimentary and in a few the Huronian is largely igneous. The three Ontario districts discussed by Dr. Miller and Mr. Knight are not unlike some in Michigan.

## ROYAL ONTARIO MUSEUM OF MINERALOGY

The Province of Ontario and the University of Toronto have had until recently no adequate quarters for the display of minerals. A splendid new building has been constructed and the collections are now being arranged. The systematic collection of minerals is one of the most complete, so far as the number of species is concerned, on the continent. The Director of the Museum, Dr. T. L. Walker, is endeavouring to make the collection of Ontario minerals a very extensive one. Circulars have been sent out announcing the occupancy of new quarters and asking for donations of specimens. Large pieces of ore can be used to advantage. The specimens when exhibited will in all instances be credited to the donor. The fact that the Geological Congress meets in Toronto this summer makes it specially desirable that the material be received at an early date.

It is to be hoped that the request will meet with a liberal response so that it will be possible to make a display that will be a credit to the Province.

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## VALUATION OF IRON MINES

The paper by Mr. J. R. Finlay on this subject presented at the New York meeting, February, 1912, of the A.I.M.E. has provoked considerable discussion and brought out interesting statements from some of the members of the Institute. Mr. Finlay's method is to determine mine valuation upon an apparent profit per ton based upon the difference between the selling price of ore and the expense of mining and marketing it for a term of years or for the expected life of the mine. Mr. E. E. White, however, considers that the factors assumed in applying this method are not justified. Of the five factors necessary to apply the method to any mine (1) the average cost per ton, (2) the ore reserves, (3) the production per year, (4) the average selling price, (5) the present value of a $1 per year dividend, Mr. White considers that (1) and (2) may be determined with fair accuracy, although in many cases the ore reserves are only estimates based on drilling, and although the average cost may only be determined by past experience, and may be different in the future, due to varying costs of labour, increasing cost and poorer quality of timber, and the possibility of even greater taxation. The production per year is a known factor. The last two factors Mr. White considers to be purely matters of personal opinion. He believes Mr. Finlay's method may be successfully used, but that the five factors for operating iron mines in Michigan should be determined as follows: (1) The average cost of production at lower lake ports for five years, plus or minus the difference in cost per ton of taxes due to such revaluation; (2) the estimated ore reserves: ore based on diamond drilling to be estimated very conservatively; (3) the average production per year for the last five years, if the mine has been equipped to produce actively for that length of time, otherwise for the number of years during which it has been so equipped; (4) the average selling price at lower lake ports for 18 years; (5) the present value of a $1 per year dividend based upon a 10 per cent. return on the investment, and capital returned in ten years of operation by investment of an annual sum at 3 per cent.

Mr. Finlay, in reply, states that Mr. White's method gives a valuation for the Michigan mines, on an 18-year life, of $42,000,000, and states that in his opinion the properties cannot be bought for three times this valuation.

It is not likely that the mine owners and the State will ever agree entirely on the question; but open discussion will lead to a fuller knowledge of the facts. It is to be expected that Mr. Finlay will endeavour to make it clear that his method is correct, and it is also to be expected that those interested in the mines taxed on his valuation will endeavour to show that his figures are too high. From the discussion we may learn how to put a fair price on a Lake Superior iron mine. In a recent judicial decision Mr. Finlay's method has been upheld by the courts.

## SECONDARY ENRICHMENT OF SULPHIDES

Those engineers and geologists who for economic or purely scientific purposes had occasion to study carefully the sulphide deposits of many of the Western and Southern mining districts of North America, found that the deposits showed three more or less well defined zones. A shallow zone of lean or barren vein material, an intermediate zone of rich ore and a deeper zone of leaner ore. Often the intermediate zone proved to be the only portion which could be profitably mined, and its relation to the others became a question of first importance. Independently three geologists, from the facts observed by many men who were familiar with the deposits, and from their own observations, formulated the theory of secondary enrichment. This satisfactorily explained the phenomena and assisted materially in obtaining an intelligent idea of the character of many orebodies.

The deep ore is considered as primary, having been but little altered since the deposit was first formed. The shallow zone is supposed to have lost considerable of its metallic content by solution and downward migration of metallic sulphides. The intermediate rich zone has supposedly been formed by the redeposition of sulphides from the downward migrating solutions.

Like most theories, this one of secondary enrichment seems to fail in many cases to explain the facts. It has so often been demonstrated as the true explanation, however, that it has proven a very useful guide in the valuing and developing of many deposits.

Unfortunately, it is frequently applied to deposits which differ fundamentally from those in which were observed the phenomena which led to the formulation of the theory. In such districts as Northern Ontario, where glaciation has removed the weathered zone, the theory without modification has no legitimate application. There the present surface must be regarded in most cases as having no necessarily close relation to the richest portion of an orebody. It is rather a chance surface due to the varying degrees of erosion after the deposits had reached practically their present condition.

It is, therefore, of interest to read in Mr. W. H. Emmons' recently published U. S. G. S. bulletin on the Enrichment of Sulphide Ores, that he does not consider many of the ore deposits of Canada to be correctly referred to as examples of secondary enrichment. Some paragraphs from his discussion on glaciated deposits will be found elsewhere in this issue.

## SEE THE MINES OF CANADA

The excursions to be held in connection with the International Geological Congress this summer will include trips to nearly all of the leading mining districts of Canada. Those who join the Congress will have unusual opportunity of visiting the producing mines. Coal, asbestos, silver, copper, nickel, lead, gold, and natural oil and gas properties will be inspected. Complete guide books and maps will be available. There will be special private trains, and the railroads have made remarkable reductions in rates for the period, June 15 to October 31.

## CORRESPONDENCE

### THAT "SUGGESTION FROM THE WEST"

Editor Canadian Mining Journal:

Sir,—May I add to the later part of your editorial comment of June 1, on the suggestion of the British Columbia Mining Association, that Mr. R. F. Green, M.P. for Kootenay, British Columbia, be appointed Minister of Mines for Canada, that the report of the meeting of the Association published in the Daily News, of Nelson, B.C., includes a misstatement, which is contained in the following excerpt from that report: "Mr. Retallack moved the resolution, urging the Government to create a separate portfolio of Minister of Mines, and to appoint the member for Kootenay, and quoted a resolution passed by the Canadian Mining Institute which suggested Mr. Green for the position." The point I wish to make quite clear is that at no time has the Canadian Mining Institute even considered a resolution suggesting Mr. Green for the position of Minister of Mines, not to say passed one. I may add that the seconder of the resolution moved by Mr. Retallack at the meeting of the Association above referred to has informed me that Mr. Retallack did not make the quotation as stated.

E. JACOBS.

Victoria, B.C., June 7, 1913.

# SURFACE PROSPECTING AT COBALT

The first discoveries at Cobalt were made by examining the rock outcrops. The ore, disintegrated for a few feet by weathering, was usually partly decomposed, the silver being tarnished and the arsenides oxidized. The oxidation of the cobalt minerals to pink erythrite, or cobalt bloom, furnished a remarkably good indicator. Thin films of bloom were commonly found when the rock near a vein was broken. The erythrite, however, does not retain its colour long when directly exposed to the weather, and is, therefore, of comparatively little value as an indicator until the rock is broken.

**Cleaning Rock Surface, Nipissing Mine**

The early prospecting consisted of examining all small crevices in the exposed rocks. The presence of ore was usually detected by the crevice yielding a soft black mud—cobalt oxide—containing nuggets of native silver, or by the brightly coloured arsenates of cobalt and nickel found a few inches below the surface.

After the well-exposed rocks had been closely examined, the practice of digging trenches to bed rock was begun. Where not actually exposed, the rock is usually covered with only a few feet of glacial debris—sand, gravel and boulders. This practice proved successful and many veins were thus discovered. The first trenches were run irregularly and in the most easily prospected places. Later, in areas which proved productive, trenches and cross-trenches were run at short intervals—50 to 100 feet. The digging of the trench is followed by thorough cleaning of the bed rock. This is then carefully examined. Any crevices found are stripped for some distance and the rock is broken frequently along them. It is a common occurrence for such diligent following up of mere cracks to be rewarded by the discovery of narrow veins of rich ore.

Recognizing the advantage of having the overburden removed, the Nipissing Mining Company in 1906 pumped up water and washed the soil completely from a small area of the property near the shore of Peterson Lake. Later a pump of much larger capacity was installed, and in 1912 hydraulic prospecting began in earnest at the Nipissing.

At the shore of Cobalt Lake an electric-driven turbine is pumping water up Nipissing Hill to clean the rock surface. From the $3\frac{1}{2}$-inch nozzle, 4,800 gallons of water per minute is directed against the glacial deb-

**Giant Nozzle, Nipissing Mine**

**Pumping Plant and Pipe Line**

ris. The sand and gravel are quickly washed away. To break rock and scatter beds of heavy boulders dynamite is used. The practice is not to wash the soil down into the lake, and very little finds its way thither. After an area has been thoroughly cleaned of debris it is carefully examined and surveyed. Subsequently in clearing an adjoining area the first is allowed to become covered again.

Already the work done at the Nipissing has been rewarded by the uncovering of several narrow veins of good ore, and it seems likely that this unusual method of surface prospecting will prove very profitable. Cheap power is available at Cobalt, and the cost of hydraulic prospecting is consequently much lower than in localities where steam-developed power is used.

The accompanying photos show the pump house, pipe line, and nozzle. A pressure gauge at the nozzle registers, under present working conditions, about 130 pounds.

**Stream Washing Sand and Gravel from Rock Surface**

# MINING AND THE CANADIAN NORTHERN RAILWAY

(Continued from June 1st Issue).

"The St. Lawrence lowlands, floored with nearly horizontal Palaeozoic strata, and bounded on the north by the southern edge of the Laurentian plateau, represent in Canada the north-eastern extension of the great plain-like area of the interior of the continent. Commencing near the city of Quebec, the lowlands stretch southwesterly on both sides of the St. Lawrence with slightly diverging boundaries, until, at Montreal, the level country is approximately 120 miles wide. Beyond Montreal, the northern boundary pursues a westerly course up the Ottawa valley to a point about fifty miles beyond Ottawa city, where a ridge of broken country—a low spur of the Laurentian highlands—projects southerly, crossing the St. Lawrence between Brockville and Kingston to join the elevated Adirondack region of northern New York. Near Kingston, at the foot of Lake Ontario, the lowlands again commence and occupy the portion of the Ontario peninsula lying between Lakes Huron, Erie and Ontario, and bounded on the north by a nearly straight east and west line from Kingston to the foot of Georgian Bay, Lake Huron.

"The widespread clays of glacial and post-glacial age that often completely hide the underlying rocks over considerable areas of the St. Lawrence lowlands have furnished the material for numerous brick and tile industries both in Ontario and Quebec. Advantage has also been taken, for the same purpose, of the shales in various of the lower Palaeozoic formations. The raw materials for the manufacture of Portland cement are abundantly displayed in the region, and support a number of large industries. Some of these utilize marls—deposits of calcium carbonate in lakes scattered over the uneven surface of the post-glacial deposits, and the clay beds of these deposits, while others use Palaeozoic limestone. These limestones of several of the formations, and more especially of the Trenton group, are also extensively quarried both for building stones and for the production of lime. At several points the limestones are also used in the making of calcium carbide, while the dolomites are used in the manufacture of pulp.

"The Laurentian Plateau region, surrounding Hudson Bay with a U-shaped form, has an area of over 2,000,000 square miles. Limited in the east by the North Atlantic and by the gulf and estuary of the St. Lawrence as far as the City of Quebec, its southern boundary there passes inland and up the Ottawa river to beyond the City of Ottawa, then turns abruptly to the south and crosses the International boundary at Brockville. Farther west, at the foot of Lake Ontario, it crosses back into Canada and follows a nearly due east and west line to the foot of Georgian Bay, from which point the two upper Great Lakes form the bounding line. West of Lake Superior the Laurentian plateau region extends south into the United States. In southeastern Manitoba the boundary again enters Canada, and from there passes along a general northwesterly course through Lake Winnipeg, Great Slave Lake, and Great Bear Lake, to the shores of the Arctic Ocean.

"Noted for its timber resources, the Laurentian plateau, where best known, is no less important from the standpoint of mineral wealth. Along the southern margin occur the noted copper and nickel ores of Sudbury, and to the north of these lie the Cobalt silver deposits. In eastern Ontario, and the adjoining portion of Quebec, are numerous and important deposits of graphite and mica. All through the region occur iron deposits, some now being mined, and many in the near future destined to become commercially important. Besides these, many other ores, both metallic and non-metallic, are known, although the country connot in any sense be said to have been closely prospected. Nor do these mineralized belts seem to be confined to the southern part of the country, but everywhere through the Laurentian Plateau region the general conditions appear to be similar, and it is certain that many deposits of economic value yet remain to be discovered.

**Gold.**—"In Eastern Ontario the auriferous deposits appear to be confined to a belt of varying width and about seventy miles long, extending through Peterborough, Hastings, Addington, Frontenac, and into Lanark County. This region is occupied by crystalline limestones, various types of schists, and bodies of dark basic rocks, all commonly grouped as the Hastings-Grenville series, and cut by bodies of granite. The gold deposits occur in the older rocks, generally near granite intrusions and along lines of fissures containing quartz veins or lenses, and, commonly, with abundantly associated mispickel, sometimes mined for arsenic.

**Copper.**—"Most of the copper won in the Laurentian plateau comes from the nickel-copper mines of Sudbury.

"In the Parry Sound district a number of discoveries of copper ore have been made. At a point about two miles east of Parry Sound a schistose diorite is more or less charged with bornite, chalcocite, and chalcopyrite, over a zone about 1,000 feet long and 250 feet to 400 feet wide. In places the ore is associated with stringers of quartz, but in general it occurs in bunches or pockets through the impregnated rock. At another locality in the same district, about eight miles south of Parry Sound, a garnetiferous gneiss is impregnated with copper and iron sulphides, over a band about 1,000 feet long and 30 to 75 feet wide.

**Zinc.**—"Zinc blende, usually accompanied by galena, occurs in workable deposits at a number of points in Quebec and Ontario. The Olden or Richardson mine, in Frontenac County, has been worked in recent years. The ore consists of a mixture of zinc blende and argentiferous galena. The deposit is irregular, and occurs in a band of crystalline limestone of the Hastings-Grenville group. Some work has been done on zinc deposits at Calumet.

**Iron.**—"Throughout Eastern Ontario and adjoining portions of Quebec, in the districts in which the Hastings-Grenville series occurs, are numerous deposits of magnetite. Many of these have been worked for years, and some are being mined at the present time. The deposits, though usually irregular in shape and distribution, are often of considerable size. In one instance, at the Mayo mine, Hastings County, the ore has been worked from an open pit 1,100 feet long by 220 feet broad, while a drill hole was sunk 140 feet without passing out of ore.

"In many cases the ore bodies lie along the contact of crystalline limestone and granitic or other igneous bodies. At times considerable pyrite is present, necessitating the cobbing of the ore. The general conclusion is that the ores are of contact metamorphic origin. Other iron ore deposits of the Hastings-Grenville districts lie within bodies of basic igneous rocks, are characteristically irregular in their occurrence, and doubtless are of direct igneous origin. Somewhat related in type are the masses of highly titaniferous magnetites so often associated with the various anorthosite bodies occurring throughout the eastern part of the Laurentian plateau. In size these titaniferous ore bodies vary widely, sometimes reaching large dimensions."

Recently some of the magnetite deposits of Eastern Ontario, referred to by Dr. Young, have been more energetically worked and a concentrator is now in operation at Trenton, treating the ore produced by the Canada Iron Mines, Ltd. A description of the mines and plant follows.

## THE CANADA IRON MINES, LIMITED.*

The Canada Iron Mines, Limited, was organized for the purpose of operating the important magnetite deposits along the line of the Central Ontario Railway. It owns the Bessemer and Childs group of mines near L'Amable Station, the Coe Hill mines at Coe Hill, and the Blairton mines near Marmora.

The Canada Iron Mines, Limited, ships the ores to its concentrating plant at Trenton, where it undergoes magnetic concentration, making a marketable product. In this manner, by a centralization of treatment and of administration it is able to achieve low costs, and by mining the various ores in their proper proportion according to their different characters, it is able to produce a product admirably suited to the blast furnace.

It has been necessary so far to open only the Bessemer and Childs group, and we will consider these mines first.

The Bessemer and Childs group comprise 3,100 acres of mineral lands situated in the Townships of Mayo and Dungannon in the County of Hastings. These mines are not directly on the Central Ontario Railway, but are five to seven miles east from L'Amable Station on that railway. The Bessemer and Barry's Bay Railway connects the mines with the Central Ontario near L'Amable. It is owned and operated by the Canada Iron Mines, Limited.

Bessemer Post Office is situated five miles from the junction of the Central Ontario Railway and Bessemer & Barry's Bay Railway, and here is located the mine office, store, club and settlement, etc., for both Bessemer and Childs mines.

**Bessemer No. 4 mine** is the most important mine at Bessemer and is the only one being operated at the present. At this mine two large ore bodies are being developed—the north lens and the south lens. The latter lies to some extent under Little Mullet Lake, and although opened up considerably under this lake, the workings are unusually dry. Of course a thick pillar is left between the workings and the lake bottom. The ore bodies are both of large size and permit mining methods to be used which give low costs for underground mining. The ore is extracted by overhand stoping on the shrinkage system, no timber being used.

Hammer drills are used for stoping. Three and one-quarter piston drills are used for all drifting. Hammer sinkers were tried for shaft sinking, but have not yet been a success owing to a great breakage of steel. This will be overcome by using 1⅛-inch hollow hexagon, instead of 1-inch as now used.

The ore is hoisted in a one-ton skip and is dumped directly into a No. 6 "K" Gates gyratory crusher. The crusher discharges onto a 22-inch troughed belt conveyor equipped with ball-bearing idlers. The conveyor is 44 feet long and is installed on a slope of 18½ degrees to gain headroom. The conveyor discharges either into the car loading bins, or into the tramcar for stockpiling.

The management intends to install a magnetic cobber at the head of this conveyor to reject clean rock. At the present time this is handpicked to some extent.

Very little pumping is required at this mine, as the ground is free from fissures. There is just enough dampness to keep the mine from being dusty.

Power is produced entirely by steam. The boiler plant consists of two 150 horsepower horizontal return tubular boilers. The compressor is a Nordberg cross-compound, two-stage machine of a capacity of 1,400 cubic feet of free air per minute. It has an independent jet condenser. The hoist is a duplex 12 x 22 engine with a single drum 6 x 5 feet.

In the blacksmith shop is installed a Leyner Drill Sharpener, which sharpens the drill steel for both the Bessemer and Childs mines.

The ore deposit at Bessemer is very large, there being 200,000 tons of ore developed by the present work-

*Written by W. D. B. Motter, Jr., Manager, Canada Iron Mines, Ltd., and published by courtesy of R. H. Flaherty, Chief of Mines Dept., Mackenzie, Mann & Co., Ltd.

ings, and the mine has really been only superficially opened. One of the accompanying photographs shows a general view of Bessemer mine, and the stockpile in the foreground.

**The Childs mine** is situated two miles northeast of Bessemer, and is the present terminus of the Bessemer & Barry's Bay Railway. This is a very large deposit which is now being developed. It has been explored by diamond drilling to a depth of about 300 feet, proving the existence of an ore body containing one and a half million tons above that depth. The ore body is wide even at that elevation, showing no signs of its being near the bottom of the deposit. The management is confident that the total ore reserves will be much in excess of the above estimate.

Crushing Plant, Childs Mine.

Bessemer Mine, Hastings Co., Ont.

The above ore body is known as Childs No. 1, and there is also a second deposit about 300 feet north of No. 1, which has a very large tonnage, but is not of such a good grade as the No. 1 deposit, and is therefore not being opened at the present.

The Childs No. 1 deposit is being developed as an open pit mine. The ore body is about 100 feet wide, but is divided into several lenses by narrow igneous dikes, consisting mostly of syenite. These dikes complicate the mining method to a certain extent, as it is necessary to do some dead work in opening up the working faces. The deposit is being attacked at several places, one of the accompanying photographs showing the opening near the eastern end. This is the latest opening. The hanging wall of the deposit is shown at the left of the photograph. The footwall is in the swamp at the extreme right.

Eastern End, Childs Mine

The ore is broken down by one steam drill at each working face. It is hand loaded into low bodied wooden end-dump tramcars of the coal mine type. These cars have a capacity of two and one-half tons, and are 36-inch gauge. The loaded cars are gathered and hauled by a 12½-ton dinkey locomotive to the foot of the hoisting incline.

The ore tramcars are hoisted up the inclined trestle as shown in photograph. They dump automatically into the No. 5 "K" Gates gyratory crusher, which rests on the crib foundation. The crusher discharges into the loading bins, thence into the railway cars.

It is intended to install here also a magnetic cobbing plant to reject clean rock and thus raise the grade of shipping ore.

There is enough ore in the Childs mine, above the 300-foot depth to ship 500 tons per day for ten years. Owing to the low cost of open pit mining, a large proportion of the above ore can be mined very cheaply, and even as an underground mine, the costs should be low owing to the large size of the deposit, and the mining methods that can be used.

**The Coe Hill mines** are situated in the Village of Coe Hill, for many years the terminus of the Central Ontario Railway. In fact, this railway was originally built from Trenton to Coe Hill, principally to handle the ore from the Coe Hill mines.

The Canada Iron Mines, Limited, has not done any work at Coe Hill, as it is necessary to do some additional experimenting, owing to the complexity of the ore.

The mine is full of water, but was formerly opened to a depth of 130 feet, and it is stated that the width of clean ore at that depth is about fifty feet. The workings extend to the surface where they form an open cut. The ore here varies from 10 feet to 60 feet in width. It is stated that some 100,000 tons have been mined during the time the mine was operated, which was from 1882 to 1886.

There is now on the stockpile about 30,000 tons of ore ready to be shipped, and according to the diamond drilling, a very large tonnage of ore underground.

**The Blairton mines** are located on the shore of Crow Lake, Township of Belmont, County of Peterboro, about four miles from the Town of Marmora on the Central Ontario Railway.

These mines have been worked to a greater or less extent until 1873, having produced, it is claimed, 300,000 tons.

These mines are being held in reserve. The deposit has been drilled and a large tonnage of ore proven. It will be necessary to construct a railroad from the Town of Marmora, and to fully equip the mine.

Development work will have a very good start owing to the former workings.

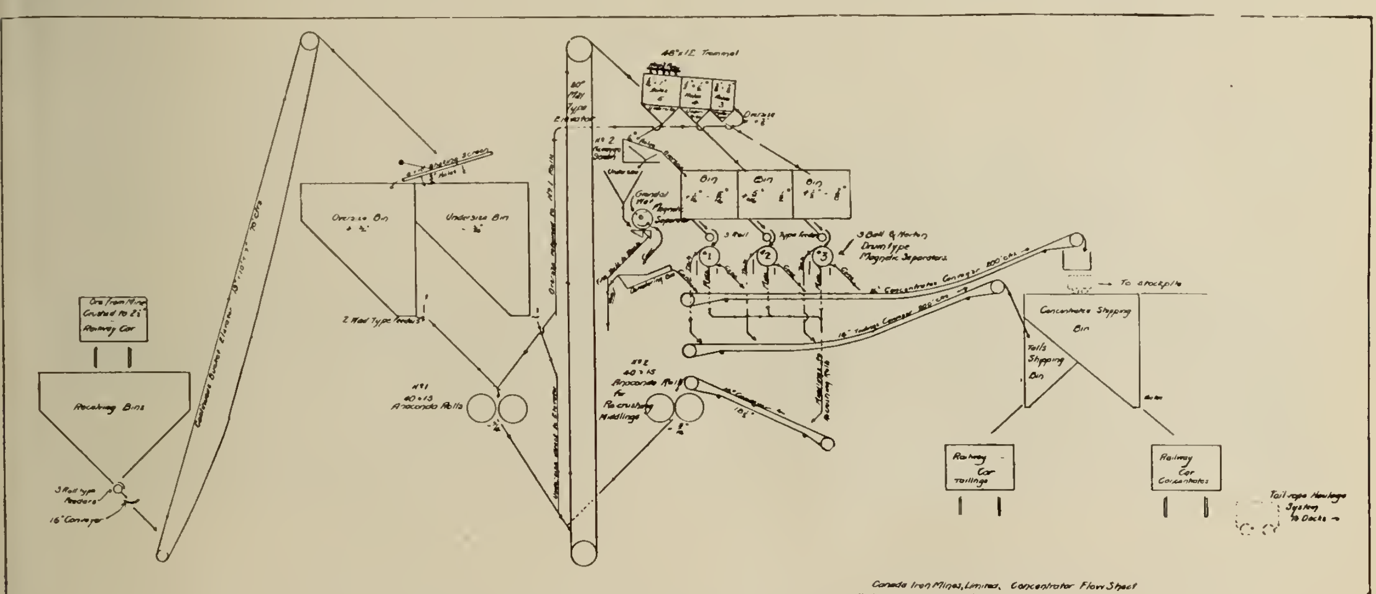
**The concentrator** is located in the Town of Trenton. Trenton has splendid shipping facilities, being a divisional point of the Central Ontario, the Canadian Northern and Canadian Pacific Railways, and also on the Grand Trunk. The Canadian Pacific is at present under construction. Besides the above railway facilities, Trenton is at the southern terminus of the Trent Valley Canal, now building, and is on the Bay of Quinte.

Very favourable rail freight rates are going into effect this month for shipments to Pennsylvania. Shipments to Lake Erie points will be made by water. It is probable that all shipments to Canadian furnaces will be by rail.

The concentrating plant was laid out on the basis of treating 1,000 tons of crude ore per day of 20 hours. This plant was divided into three units of a capacity of 330 tons each. It was considered best to build only one unit completely and to construct the other two in skeleton. It will be necessary only to install the machinery and some interior work in the building, etc., to complete the plant to its full capacity, as the steel building, trestle, etc., are all constructed for the entire plant.

The two stacks shown in photograph of concentrator are remnants of a saw mill which previously occupied this site, only one stack is now used, and is for the heating boiler in cold weather. The low brick buildings are also old, and are used for a warehouse and a shop.

The main building is of steel structure covered with a specially pressed sheet steel, which will later be cemented over to form reinforced concrete curtain walls. The interior finishing of the building, and the trestle,



**Concentrator flow sheet, Canada Iron Mines Limited**

and also the inclined conveyor housing and bins, are of slow burning mill construction.

Power conditions are very favourable at Trenton, owing to the great development of hydro-electric power along the Trent Canal system, in the immediate vicinity. This will furnish plenty of cheap power for any allied industries, which are expected to be developed later.

The Canada Iron Mines, Limited, own as a concentrator site 40 acres of land on the east side of the Trent River at the point of its confluence with the Bay of Quinte. This site consists also of an additional 40 acres of water lot on the Trent River and Bay of Quinte. Ore docks are under construction for water shipments. The Bay of Quinte, which now has a maximum draft of 10½ feet at low water is being dredged to a depth of 14 feet. The Murray Canal, which forms the western outlet of the Bay of Quinte into Lake Ontario, is also being deepened. When this work is completed vessels can be loaded to the full draft of the Welland Canal. At the present they can be loaded to a draft of 10½ feet only, at low stages of the water.

In order to make the plan of the treatment which the ore receives in the process of concentration perfectly plain, a diagrammatic mill flow sheet is shown here. Starting at the left hand side of this diagram, the ore is received from the mine in standard gauge ore cars. These are delivered on the trestle over the receiving bins into which the ore is dumped. It is drawn off from these bins by three roll type feeders, which deliver it onto a short 16-inch belt conveyor. This conveyor discharges through a chute into the buckets of the inclined continuous elevator, which elevates the ore into the mill proper, and delivers onto the shaking screen. This screen has ¾-inch square holes. The oversize goes into its bin over the rolls, and passes through an oscillating feeder to the No. 1 rolls. These are 40 x 15 inch Anaconda rolls set at ¾ inch. The crushed material then is delivered into the boot of the 20-inch vertical mill type elevator.

The undersize from the shaking screen, which is material ¾ inch in diameter and smaller, falls into its bin. This is a duplicate of the above-mentioned oversize bin. These are steel bins, lined with oak. The undersize is delivered from its bin by another oscillating feeder directly to the above vertical elevator. The entire crushed and fine product is discharged into the trommel.

The trommel or revolving screen is 48 inches in diameter by 12 feet long. It serves to grade the crushed ore in accordance with its sizes, in order that the magnetic separators will have the advantage of a sized product to treat. The first section of the trommel is punched plate five feet long with holes 5-16 inch by 1 inch. The second section is woven wire screen four feet long with ½-inch square holes. The third section is woven wire screen three feet long with ⅞-inch square holes. Wash water is added to the chute between the elevator and the trommel and also over the first section of the trommel.

mixes with the fresh ore entering the rolls. The treatment of the three different sizes in the separator bins is identical, the only difference being in the adjustments of the separators. The material is drawn from the bins by roll type feeders, which distribute it across the face of the drums of the separators. These are single drum Ball-Norton magnetic separators. Owing to the method of wiring used on these machines it is possible to make a three-part separation. The three products consist of clean tailings, clean concentrates and middlings, or particles containing both magnetite and gangue or rock. The tailings fall to the coarse tailings conveyor and are carried out to a car loading bin. The concentrates fall onto the concentrates conveyor. The middlings fall onto a short inclined middlings conveyor, which carries them to the No. 2 or recrushing rolls. These are duplicates to the No. 1 rolls, being 40 x 15 Anaconda rolls, but they revolve at much higher speed. They are set to crush to 3-16 inch. The recrushed middlings enter the system again in the boot of the vertical elevator, to be rescreened and retreated.

**Concentrating Plant, Canada Iron Mines Limited, Trenton, Ont.**

The material passing through the first section is delivered to a No. 2 "Newaygo" wet screen. This has a screening surface of woven wire with 1-16-inch or 1.6 mm. holes. This screen makes two products, an undersize and an oversize. The former is carried in a wet launder through a wooden feed box to "B" magnetic separator. This is a Grondal wet separator, and makes concentrates and tails. The latter are discarded as fine tailings, being used to make land.

The concentrates from the Grondal separator pass through a dewatering machine, which drains off most of the free moisture, and delivers them to the concentrates conveyor.

The oversize from the "Newaygo" screen is discharged into the bin over No. 1 separator. The undersize through the second and third sections of the trommel is discharged into bins over separators Nos. 2 and 3 respectively. The oversize from the trommel is material that will not pass through a ⅞-inch square hole, and is returned to No. 1 rolls to be crushed again. It

The concentrates conveyor collects the concentrates from all the magnetic separators and conveys and elevates them to a small pocket over the concentrates bin. It is then drawn off either into the concentrates shipping bin or a small tramcar to the stockpile. Railway cars are loaded from the concentrates shipping bins for rail shipments. A tail rope haulage system will convey the concentrates to the docks for water shipments.

The coarse tailings are also a marketable product, and the entire supply has been contracted for for several years. The revenue derived from their sale will amount to a considerable figure when the plant is running at its full capacity.

Although the plant was designed for a capacity of 330 tons per unit, in operation it can treat over 300 tons per ten-hour shift, and its capacity is from 500 to 600 tons per unit per day of twenty hours. The present ratio of concentration is about one and one-third tons of crude ore to one ton of concentrates. Therefore the daily production of concentrates from one unit will amount to from 375 to 450 tons per day when running two shifts. The operations are being pushed to this point as rapidly as possible.

It will be necessary to install the second and possibly the third units of the concentrates before opening up Coe Hill and Blairton mines.

The ore reserves guarantee a future ore supply for the concentrator at full capacity for many years.

(To be Continued.)

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# EFFICIENCY IN UNDERGROUND PRACTICE*

By Andre Formis.

In consequence of the increased cost of labour and supplies in the process of mining it has become advisable to investigate the various steps in the production of tonnage with a view to reducing waste factors to a minimum. The paper submitted this evening hopes to bring out a discussion on the subject of rock-drilling, the most important of the underground operations.

Considering that the labour factor in mining is about 75 per cent. of the total cost, it is evident that the savings effected in this item are proportionately of greater importance than in the matter of the other 25 per cent. of the cost. However, owing to the nature of this larger factor it is also much more difficult to accomplish any results with it, partly on account of the evident distrust of the so-called old-time mining captains of anything suggested by a technical graduate, partly on account of the inertia of labour itself, and partly on account of the natural hesitancy of some mine managements to permit anything that may seem a radical departure from ancient and honorable customs. Yet it can be shown by actual tests, supplemented by correct cost figures—by these I mean costs based on observed and recorded facts and not pro-rated costs—that material savings are easily made without departures in any manner radical in underground practice.

In order to arrive at a correct analysis of any set of conditions it is, of course, important that the observations of these conditions be as accurate as possible. It is also obvious that a long continued set of observations is more nearly correct than a short one.

In the practice of rock-drilling many different methods are employed, many sizes and shapes of drills are used. Some of these drills are better than others; sometimes, perhaps, one only is the best for a certain class of work. Careful study and patient investigation are required to come to any definite conclusion. The selection of the drill depends on a large number of factors, the most apparent of which are:

1. Hardness of the rock to be drilled.
2. Irregularities of the rock, causing the steel to bind in the holes.
3. Diameter of drill cylinder.
4. Piston stroke if any.
5. Weight of moving parts.
6. Effective blow.
7. Total weight of drill.
8. Depth of holes to be drilled and diameter of holes.
9. Style of chuck.
10. Shape of bits.
11. Use of water in holes.
12. Hollow steel with water or air jet.
13. Wages of miners, based on company account, tonnage contract, or footage drilled.
14. Cost of power.
15. Various other factors, depending on locality, etc.

Each of the foregoing factors determines in a manner the proper drill to be used. What appears to be the proper drill having been selected, first an investigation of the amount of air it consumes should be made, second, a time study of its operation.

For the first of these studies may be used the graphic air-flow meter which has been perfected by the General Electric Company (see Bulletins No. 4004, No. 4827, and No. 4941), which measures in cubic feet the air consumed by any device connected to it. The record is made on a moving roll of paper. The interpretation of the record is simple.

The principle of operation of the meter is based on the velocity head. Consider a small pipe inserted in the airline in such a manner that the leading opening faces against the direction of flow and the trailing openings face in the direction of flow. These two pipes are connected to a vertical U-tube containing mercury. Thus the air flowing in the pipe impinges against the leading opening and sets up a pressure in the leading pipe which equals the static pressure plus a pressure due to the velocity head. The drag of the air on the trailing openings lowers the pressure in the trailing pipe. Due to the differential pressure, the mercury in the U-tube is deflected until the unbalanced column exactly balances the differential pressure. Since the leading set of openings extends approximately across the diameter of the pipe, the velocity pressure transmitted to the meter is the mean velocity pressure due to the flow of air, rather than the velocity at a single point in the pipe.

One of these meters was installed at the property with which I am connected. The meter was first used on the 1900-foot level to measure the amount consumed by a R 3 drill and a Butterfly drill No. C100. Only one drill was working on the line at a time. A recording air-gauge was also connected to the line, to ascertain the air-pressure near the drill for comparison at any instant with the graphic flow-meter records.

For a fairly accurate time study of the operations of the drill, nothing more is needed than a watch and a note book. Mr. R. T. Dana and Mr. W. L. Saunders in their work on rock-drilling have published a formula which permits of a set of short observations being used for an estimate of drilling performance. The formula is:

Time to drill one hole $=(c-fd)\ D/f-(l-g-k)$ in which the quantities signify as in the table following. The table includes also the figures obtained at our mine.

| | | | |
|---|---|---|---|
| e=average time to change steel | our figure, | 4.00 | min. |
| d=average time to drill one foot | our figure, | 4.87 | min. |
| l=average time to move drill | our figure, | 16.00 | min. |
| g=average time to set up drill | our figure, | 12.00 | min. |
| k=average time to blow, blast holes, etc. | our figure, | 24.00 | min. |
| D=depth of holes in feet | our figure, | 8.1 | ft. |
| f=length of feed | our figure, | 2 | ft. |
| fd=time to drill length of feed | our figure, | 9.6 | min. |
| Number of bits per hole | our figure, | 4.0 | |

Then if 540 is the number of working minutes per day shift, the number of holes per day shift=

$$\frac{540}{(e-fd)\ D/f-(l-g-k)}$$

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*A paper presented at Michigan College of Mines Club, Houghton, and published in the M. C. M. Alumnus April, 1913.

It may be seen that a slight difference from average values will materially affect the result.

The time record taken from the chart of a single shift —day shift, January 31, 1913—is as follows:

| | | |
|---|---|---|
| Drill reciprocating | 36.5% | |
| Changing steel | 14.4 | |
| Moving drill on post | 17.5 | |
| | | 69.4% |
| Mucking out out for post | 10.7% | |
| Time lost going to face | 4.1 | |
| Getting drill steel and water | 2.2 | |
| Cleaning and charging holes | 2.8 | |
| Blasting | 2.9 | |
| Blowing smoke | 7.8 | |
| | | 30.5% |

Number of holes per shift, 6.
Feet drilled per shift, 40.5 (medium hard amygdaloid).
Cutting speed, 4.205 ft. per min.

The air pressure was about 96 lb. absolute, the consumption of air around 110 cu. ft.,—for the C110 drill 85 cu. ft.

From this time study it appears that the first three factors, amounting to 69.4 per cent., are inherent in the operation of the particular drill and cannot well be reduced. The other factors, amounting to 30.5 per cent., may be reduced for the benefit of the former,—that is, for more actual drilling time. This may be accomplished by a change in the method of drilling holes or by employing additional labor to perform part of the 30.5 per cent. time-loss, always with the condition that the cost of the additional labour is repaid by the increased footage obtained. In our case it is not.

# GLACIATION OF ORE DEPOSITS*

By W. H. Emmons.

In comparatively late geologic time a considerable portion of North America was capped by a continental ice sheet, which removed by erosion the loose debris and the surface rock over great areas. Glaciation was most extensive in northern latitudes, but the continental glacier extended southward as far as Ohio and Missouri rivers, and smaller glaciers accumulated in the more lofty mountain ranges of the American Cordillera. Many of the ore deposits that lay in the paths of the glaciers were planed off, and the ores in their upper zones were scattered in the rocky material which was left when the ice had melted. Erratic fragments of such deposits have been carried far from their sources and have been the cause of much fruitless prospecting.

The outcrop of an ore body may be removed gradually by erosion by water, but weathering generally precedes erosion. The solutions may leach the valuable minerals from the outcrop and may precipitate them at a lower level, where they will be preserved. But weathering does not attend erosion by ice, and chemical action of low temperatures is slight; consequently the metals present in the portions of the deposits that are removed are likely to be scattered. The extent to which the ore deposits in a glaciated region were weathered or otherwise altered by surface agencies before the glacial period began can not be estimated. The amount of rock removed by the continental ice sheet is known to be considerable, however, for the drift which it deposited is in many places more than 200 feet thick. It is probable that glacial erosion was in places equally great or greater. Whatever the amount of ice erosion, it appears to have been sufficient to remove the highly altered zones in most parts of northern North America.

As stated already, the processes of solution and enrichment are retarded in regions of low temperature. The areas in which ice erosion has been most vigorous are those in which the lower temperatures prevail today, and there is reason to suppose that the deposits in these areas were not so deeply altered before the glacial epoch as were similar deposits at lower latitudes. In Canada and in Alaska there are few large deposits of sulphide ores which are clearly of secondary origin. If the deposit at the Bonanza mine in the Chitina copper region, Alaska, is primary no large rich secondary sulphide deposits in Alaska are known to me. The sulphide ores now exploited in Canada, except possibly the deposits at Cobalt, in the silver-bearing region of Ontario (which some have considered of secondary origin), and certain well-authenticated examples in British Columbia, are generally believed to be primary. I know of no important secondary deposits in New England. Small deposits of chalcocite ores were exploited in the Ely district, Vermont. In a copper deposit at Milan, N.H., where the sulphides outcrop at the very surface, no considerable amount of oxidation has taken place below 30 feet, and in general oxidation is trivial at even shallower depths. Only a little chalcocite enrichment has taken place. the secondary ore consisting of primary yellow sulphides coated with thin films of chalcocite, adding to its value probably not more than 1 per cent.*

In Norway and Sweden, according to Vogt, the surface has been polished clean by the Quaternary ice sheet, and secondary alteration is insignificant.

Glaciers do not erode their beds equally at all places. In their higher portions, where the ice is accumulating, pressures are greater, the ice is more rigid, and erosion is more vigorous. Near the margins, where the ice is melting, deposition exceeds erosion and the deposit of drift protects the surface from wear. These differences are very conspicuous in some mountainous sections of the West where the glaciers covered only portions of the country and the processes are more clearly shown. In some of the ranges of Montana, Colorado, and Utah, where ore deposits are numerous and varied, the evidences of mountain glaciation are conspicuously preserved. At some places the mountain glaciers seem to have removed very little of the altered ore, for the secondary sulphide zones and even the oxidized ores are intact, and some of these appear to be too extensive to have formed since the Quaternary glacial epoch. The Amethyst lode at Creede, Colo., has an extensive secondary zone, and one end of this lode was over-ridden by the ice in late geologic time. In general, erosion by mountain glaciers has been localized, the maximum wear taking place near the heads of the glaciers.

Erosion by the continental glaciers is also somewhat erratic, for great differences in the effect of the action of ice may be seen in a comparatively small area. In the Mesabi range of Minnesota the hard, fresh country rock is polished clean in places, whereas a few rods away and at but slightly lower elevations thick bodies of cellular, almost powdery iron-oxide ore remain intact. These facts suggest that other important secondary zones may be encountered when the area over-ridden by the continental ice sheet is more thoroughly developed.

*Extract from Bull. No. 529, U. S. G. S., "The Enrichment of Sulphide Ores."
*Vogt, J. H. L., "Problems in the Geology of Ore Deposits," by Posepny, Franz. The Genesis of Ore Deposits, 1902, p. 675.

# RAISING SHAFT AT ROLLING MILL MINE, NEGAUNEE, MICH.*

By Edwin N. Cory.

The new shaft of the Rolling Mill Mine of the Jones & Laughlin Steel Co., was raised from the 621-foot level to the surface by the following method:

The work was started from this level and carried through to surface with one continuous raise. A force of nine miners divided into three shifts of three men on each shift working eight hours per day was employed. These men also trammed the material from the raise to No. 1 shaft, a distance of 750 feet, and put in the timber. The difficulties of raising so great a distance were successfully overcome and no accidents or delays occurred during the progress of the work.

The raise was 8x8 feet in size and was divided into three compartments. One compartment, 4x4 feet, including the timber, was used as a bucket way for hoisting tools and timber and a station was cut at the bottom of this compartment on the main level, in which was placed a small hoist. Another compartment, 4x4 feet, was used for ladders and an 8-inch pipe from air fan, also one 1¼-inch pipe for speaking tube and one 1½-inch air pipe for the power drills. The other half of the raise, 4x8 feet, was used for the rock broken in the raise, and was not timbered but kept filled with rock up to the height of the timber in the other compartments. A chute was constructed in the bottom of this compartment through which the rock was run when loading into tram cars. (See Fig. 1). A fan was placed at No. 1 shaft which forced the air through the 8-inch pipe up to the top of the raise, the current being down through one of the compartments, thus securing perfect ventilation.

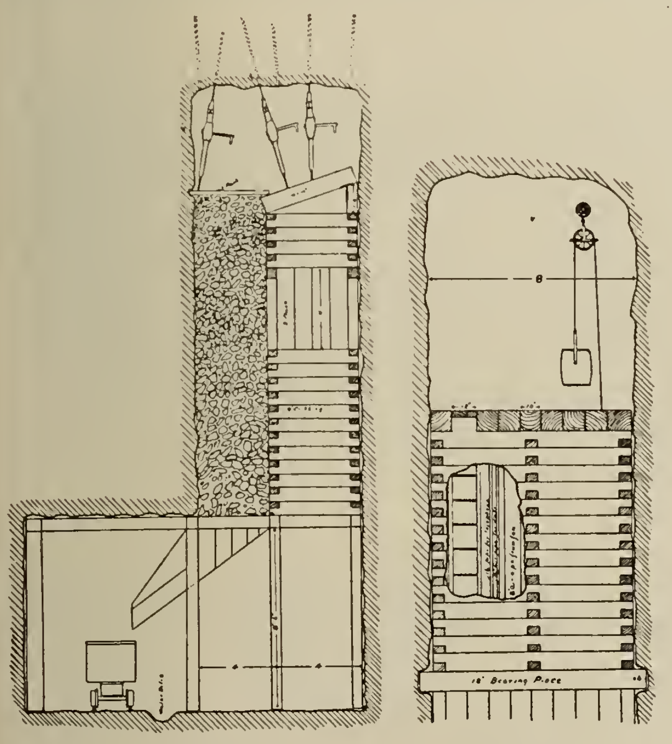


**Fig. 1. Fig. 2.**

**Method of raising shaft through rock.**

The type drill used was an Ingersoll-Rand, 2-inch cylinder B. C. 21, butterfly valve hammer drill. Three drills were operated at one time to drill the raise over, which consisted of 18 holes in three rows, six holes in each row. The cutting-in holes were drilled, so as to cut a space when blasted through the entire length of the raise directly over the rock compartment (Fig. 1) so that the other holes would throw the rock toward this opening and fall into the rock compartment. Before blasting, the ladder and bucket compartments were covered with 10-inch round timber, flattened on two sides to prevent rolling, and placed at an angle to deflect the falling rock into the rock compartment, necessitating only a minimum amount of shovelling. The space directly over the ladder compartment, was covered with 3-inch plank to permit the men to get away quickly when blasting, also to give them perfect protection in going up and down the raise (Fig. 2). The blasting was all done with fuse cut in various lengths to give the desired results. After blasting, and while the smoke was clearing out of the raise, the miners would tram enough rock out of the chute so that timbering could be commenced at the top of the raise. A gin-pole was erected about 8 feet from the last set of timber on which was hung a 10-inch sheave wheel for the rope used in hoisting the timber from the level below (Fig. 2). After the timber had been put in it was also used for hoisting the sharp drills and machines to start drilling. The drilling machines were thoroughly overhauled after each round of holes while the miners were blasting and timbering, and no delay was occasioned during the work.

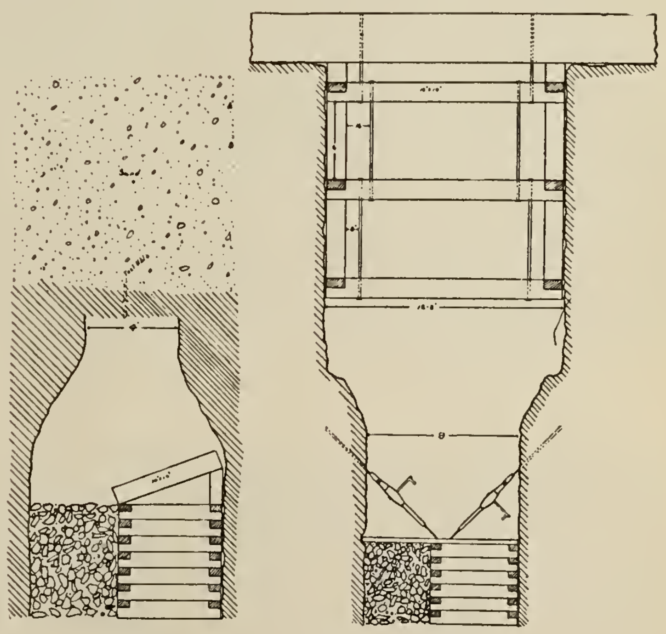


**Fig 3. Fig 4.**

**Method of raising to surface and enlarging shaft**

When the raise had been carried to a height of about 200 feet, hitches were cut in the rock and a set of bearing pieces put in about four feet above the last set of timber, and planked up with 3-inch plank. This

*Prepared for Houghton Meeting of the Lake Superior Mining Institute, and published in Vol. XVII of the Transactions, pp. 112-116.

was done to take the weight of the timber for the next 200 feet instead of letting it rest upon the timbers below. (See Figs. 1 and 2). A station 15 feet long was cut in the side of the raise about every 200 feet, to shelter the men when blasting instead of going down the ladders the whole distance to the level below.

In this manner the raise was carried to the height of 570 feet, which was 51 feet from the surface, when a smaller raise was carried up as is shown in Fig. 3, a test hole being drilled in advance of the top of the raise to ascertain the depth of the sand. When within 18 feet from the surface, sand was reached by the test hole, and the raise continued by carefully working through the sand to within 10 feet of the surface. A hole was then drilled from the surface, blasting the sand through to the opening below.

The work of enlarging the shaft was then begun. The surface at the opening made by the blast was levelled off and two stringers, 2 feet 6 inches in diameter and 25 feet long, were placed in position for timbering through the same. The dimensions of the shaft are 10 feet 2 inches by 12 feet 2 inches within timbers; 12x12 inch fir timber was used and the plan of timbering is shown in Fig. 4. The principal feature of this work was the method used in enlarging the opening made by the raise to the dimensions required by the permanent shaft. The type of hammer drills used in raising was also used for this work. The rock was drawn off through the chute at the 621-foot level as in raising until it was lowered about 15 feet. The timber from the raise was then pulled out for a distance of 15 feet and the two smaller compartments covered over as before. The holes were drilled upwards as in raising, but at an angle of 45 degrees, and were started 10 feet below the permanent shaft timber and so located as to strip 5 feet of the shaft at one blast, thus making room for one set of the shaft timber.

Ordinarily this work is done by drilling holes downward, but, as the above method proved very successful, it was continued for the entire shaft, and I think the use of the hammer drill a great improvement over the reciprocating type with shaft bars or tripods.

The progress made in the work was as follows:

Raising—621 feet; No. days, 125; average per day, 5 feet.

Cutting down—621 feet; No. days, 114; average per day, 5.44 feet.

Work started September 5th, 1911; completed July 15th, 1912.

# CONCENTRATION OF COBALT SILVER ORES

By Reginald E. Hore.

Remarkable success has been obtained in treating Cobalt silver ores by straight concentration. Experience led most of the millmen to screen the ore first, hand pick the large and jig the small sizes, crush the tails with stamps, and concentrate the pulp on tables. At some mills the sorting belt tailings go direct to stamp bins, at others the ore is first recrushed and then sent to the jigs. The tails from the tables are usually run over canvas.

In some cases rolls are used instead of stamps, and at the Buffalo they are said to work very satisfactorily. At the Coniagas, Krupp ball mills were used at first; but these were discarded in favour of stamps. The equipment of most of the newer mills with stamps indicates that experience has shown this to be the most efficient method of crushing to the desired fineness.

The results obtained by concentration at Cobalt during 1912 are given in the accompanying tables, taken from Mr. A. A. Cole's report to the T. & N. O. Commission:

**Concentration in Cobalt During 1912.**

| | Mills and Mines. | Tons Milled. | Concentrates. Jigs. | Tables. | Totals. | Concentration Ratio. |
|---|---|---|---|---|---|---|
| 1. | Beaver | 14,602.0 | 113.4 | 129.3 | 242.7 | 60—1 |
| 2. | Buffalo | 51,900.0 | .... | .... | 1,242.2 | 42—1 |
| 3. | Casey Cobalt | 1,585.0 | .... | 43.2 | 43.2 | 36—1 |
| 4. | Cobalt Lake | 1,585.0 | 182.2 | 477.3 | 659.5 | 36—1 |
| 5. | Colonial | 7,692.0 | .... | .... | 86.0 | 89—1 |
| 6. | Coniagas | 52,797.5 | 253.0 | 919.0 | 1,172.0 | 45—1 |
| 7. | Hudson Bay | 21,509.0 | 177.0 | 453.0 | 630.0 | 34—1 |
| 8. | King Edward | 9,895.5 | 65.7 | 200.0 | 265.7 | 37—1 |
| | City of Cobalt | | | | | |
| 9. | McKinley-Darragh | 51,897.0 | 516.9 | 1,406.4 | 1,923.3 | 22—1 |
| 10. | Nipissing Reduction, | | | | | |
| | Cobalt Lake | 1,803.4 | 62.7 | 16.8 | 79.5 | 23—1 |
| | Green Meehan | 795.5 | 7.3 | 6.9 | 14.2 | 56—1 |
| | Nipissing | 14,251.0 | 87.0 | 97.5 | 184.5 | 78—1 |
| | Silver Queen | 219.8 | 2.8 | 1.6 | 4.4 | 50—1 |
| 11. | Northern Customs, | | | | | |
| | Drummond | 3,427.0 | .... | 111.1 | 111.1 | 31—1 |
| | La Rose | 33,984.0 | .... | 1,210.5 | 1,210.5 | 28—1 |
| | Townsite | 27,898.0 | .... | 1,074.0 | 1,074.0 | 26—1 |
| 12. | Penn Canadian. | | | | | |
| | Penn Canadian | 5,400.0 | .... | .... | 95.3 | 57—1 |
| | Hargraves | 546.0 | .... | .... | 4.2 | 130—1 |
| 13. | Temiskaming | 40,056.0 | 280.7 | 609.3 | 890.0 | 45—1 |
| 14. | Trethewey | 26,803.9 | 159.6 | 435.1 | 594.7 | 45—1 |
| | Total | 390,473.0 | | | 10,527.0 | 37—1 |

| | | Tons. Treated. | Bullion Produced. Ozs. |
|---|---|---|---|
| | Cyanide Mills. | | |
| 15. | Dominion Reduction | | |
| | Crown Reserve | 15,704.0 | 346,234 |
| | Kerr Lake | 5,983.0 | 130,075 |
| 16. | Nipissing | 3,447.0 | 57,875 |
| 17. | O'Brien | 39,909.5 | 229,360 |
| | | 65,043.5 | 763,544 |

| | |
|---|---|
| Total tons milled by water concentrating mills | 390,473.0 |
| Total tons milled by cyanide mills | 65,043.5 |
| Total tons milled. 1912 | 455,516.5 |

In the plants using concentration processes only there is considerable variety. The Coniagas mill has a comparatively simple flow sheet. The flow sheets of the Hudson Bay and Cobalt Lake concentrating plants are of special interest, because these mills are of recent construction.

### The Coniagas Concentrator.

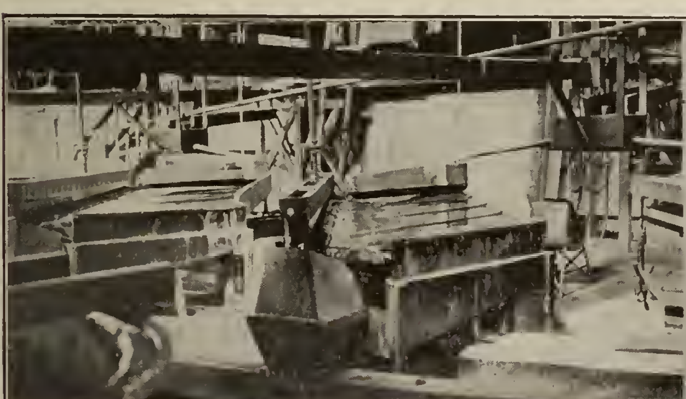
At the Coniagas property during the past year about 44 per cent. of the silver produced was from ore treated in the mill. Fifty-six per cent. was in high grade ore recovered without concentration. The mill output for the year 1911-12 was 803.3 tons high-grade concentrates and 484.2 tons low-grade slimes.

The ore from the mine is emptied from a self-dumping skip into a chute down which it runs to the mill bin. A grizzly, with 1¼-inch spaces, screens out the fine ore. The oversize is crushed to about 4 inches in a Blake crusher, elevated to bins and thence fed automatically to a gyratory crusher, the product of which is under 2 inches. The fines from the shaft-house grizzly join this crushed ore, which is then elevated and sized in No. 1 trommel, having 5-16 inch and 1¼-inch holes.

The oversize of 1¼-inch goes to a sorting belt, where ore averaging 1,500 to 2,000 ounces per ton is picked out by hand. The tails from the sorting belt are conveyed by portable belt conveyor to the stamp bins.

The undersize of 1¼-inch and over 5-16 inch goes to coarse jigs.

**Two views showing stamps, setting cones, distributors and Deister Tables, Coniagas mill**



**Deister Tables, Coniagas mill.**

**Canvas tables, Coniagas mill.**

The undersize of 5/16 inch is sized in No. 2 trommel, which has 3.5 mm. openings. The oversize goes to fine jigs. The undersize is classified in a drag classifier from which sands go to a Wilfley table and slimes to settling tanks. These mine slimes, which average 150 to 200 ounces silver per ton, are collected and shipped to smelter without further treatment.

The tails from all jigs and the Wilfley table unite and are elevated to a drag classifier, dewatered, and conveyed to the stamp bins. The water from the classifier with some slimes runs to a Callow settling tank.

Chute
Grizzles 1¼″
Tram to mill bin
Storage bin 400 tons

1

Blake crusher 9 x 15″ to 3½″
Bucket elevator 14″x7″ Style "M"
Storage bins 50 tons each
Wall type feeder to
2—Double—2 Comp Hartz Jigs
1—Wilfley table
1—Drag classifier
No. 4—Gates Short Head
Plunger feeder to
Bucket elevator 14″x7″, Style "R"
1—24″x10′—Trommel screens =½″ and 1½″
1—24″x10′ 0′ 3mm trommel
1—Bucket elevator—Dewatering
Buckets 12″x6″—Perforated—⅛″ 0 holes
1—Sorting belt 18″—to

1—Portable conveyor 12″—to Stamp storage bins=800 tons
10—Nelson feeders
2—Challenge feeders
60—1250 lb. stamps. Fraser and Chalmers
Crushing to 16 mesh
6—3′ pulp thickening tanks Callow's type
1—Sloughing-off tank Screen

13—No. 2—Deister tables
1—Wilfley table

10—8′ Callow's tanks

1—Drag classifier

8—No. 3 Deister slimers

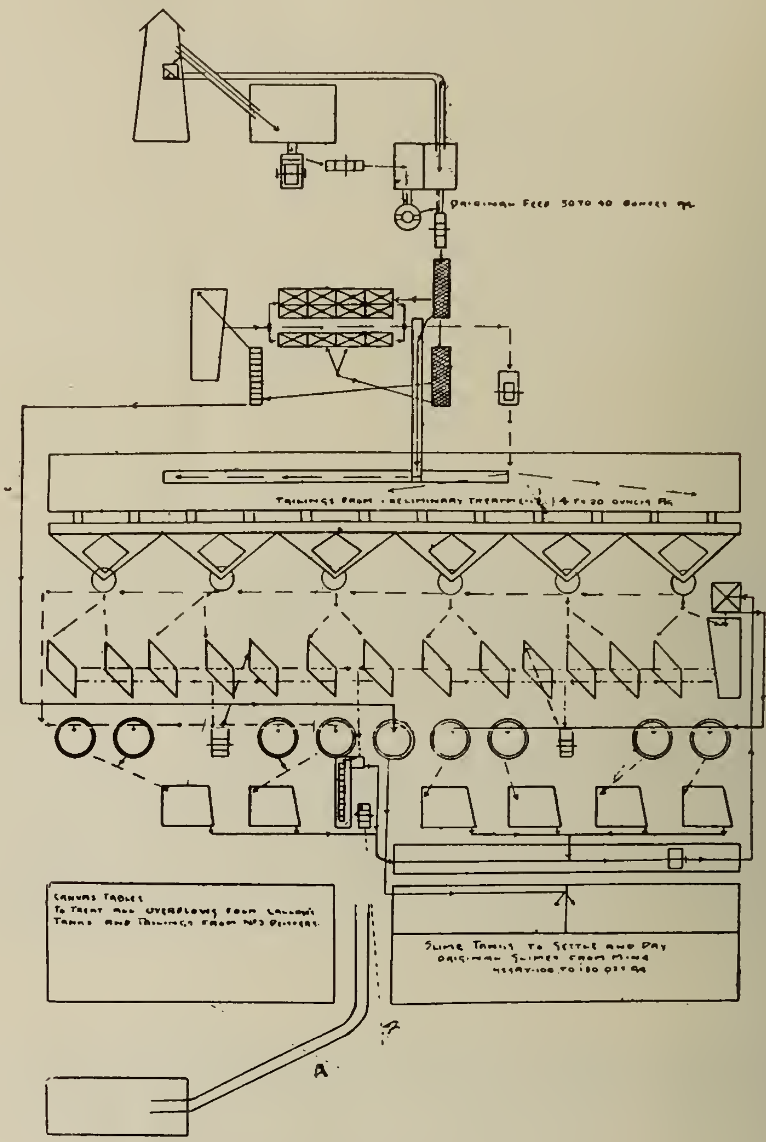
1—James slimer

1—Tailings elevator—buckets=10″x6′
1—Automatic tailings sampler
1—3″ Centrifugal slime pump

2—9 ton—1—18 ton slime tanks
Steam coils in bottom

Canvas tables—96′x20′
Tramway for concentrates

Drier



(A) Slime tails
(B) Sand tails

**Motor List.**

| For. | No. | H.P. | Av. oper'ing H.P. | |
|---|---|---|---|---|
| Coarse Crushing and Preliminary Treatment ... | 1 | 100 | 32=64 | 12 hrs. |
| Portable Conveyor ...... | 1 | 3 | 1=2 | 12 hrs. |
| Stamps ................ | 2 | 200 | 160 | |
| No. 2 Deister Tables..... | 2 | 10 | 14 | |
| Slimer Floor—Including | 1 | 10 | 10 | |
| Elevators and Pump .. | 1 | 5 | 3 | |
| Tailings Elevator ....... | 1 | 5 | 3 | |
| Total.... | | 343 | 223 | |
| Slime Return Pump ........ | | 10 | 7 | |
| Slime Storage Pump .......... | | 20 | 15 | |
| | | | 245 | |

**THE CONIAGAS MINES, LTD.,**
**Cobalt, Ontario.**

**CONCENTRATOR FLOW SHEET,**
**Capacity 180 Tons per 24 hours.**
Date, Nov. 14, 1911.
F. D. REID,
Mill Supt.

Line Notation

Original Mill Feed—Slimes From Lower Drag Classifier and Slimer Middlings.
Tailings from Preliminary Treatment and Stamp Discharge.
No. 2 Deister Middlings.
No. 2 Deister Tailings.
Tailings from Drag Classifier.
Concentrates are skimmed from Jigs and sacked—From Tables go to Settling Tanks.
Hutch Product from Jigs Returned to No. 2 Elevator—Retreated on Fine Jigs and Wilfley.

The overflow from this tank returns to the jigs. The slimes go through the system again, and uniting with the mine slimes are eventually caught in the settling tank. The accompanying flow sheet was prepared by Mr. F. D. Reid, mill superintendent, November 4th, 1911.

The treatment of the ore before stamping results in the recovery of about one-half of the silver contained in it. From heads averaging 36 ounces per ton, 18 ounces is recovered by the picking, jigging, and table concentration. Of this 18 ounces, about 49 per cent. is recovered by the jigs, 11 per cent. on the Wilfley table and 40 per cent. on the picking belt.

The sixty Fraser-Chalmers 1250-lb. stamps each crush 2.8 to 3 tons per 24 hours to pass 16 mesh. From the screen the pulp runs to 3-foot cone classifiers, of which there is one for every ten stamps. Sands from the classifier are concentrated on No. 2 Deister tables. The overflow runs to 8-foot Callow tanks, the underflow from which is treated on Reid's improved Deister slime tables. The overflow from the tank, along with slimes from all slime tables, runs over canvas tables. Tailings from the sand tables are dewatered in a classifier and the sands elevated and stacked on the property. A sample is taken of the sands as they are elevated, and this is treated in the mill on a Deister table. There is thus a constant running test being made on both sand and slime tails.

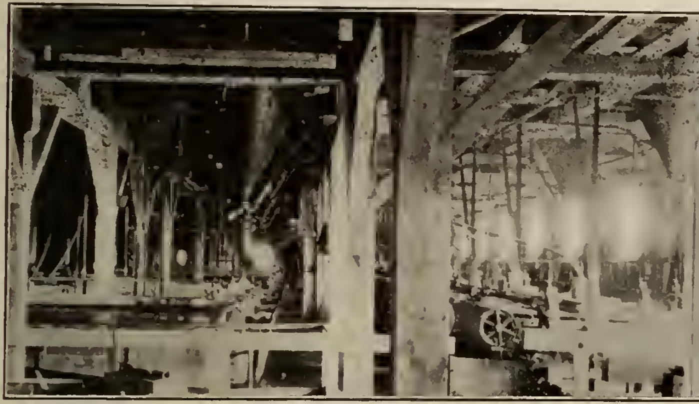
Overflow from the Drag classifier unites with middlings from the tables and is pumped back to a series of two classifiers. The coarse sands from this are treated on a No. 2 Deister, and the fine sands on a second Deister, while the overflow slimes are pumped back to four Callow tanks, re-treated on four slimers and then on canvas tables. Tailings from the canvas tables are pumped to storage pond; but a sample of this product is being retreated in the mill on one of the Reid-Deister slime tables.

The ore fed to the stamps averages about 17 ounces silver per ton. About 30 to 35 per cent. of this is slimed in crushing and the slimes are usually richer than the sands, the relative content being about 5 to 4. The slime tails average 6 to 8 ounces and are being saved for possible future treatment. The sand tails average 3.5 to 4.5 ounces and are being stacked beside the mill at a cost of about $250 per year, during which time the product is about 35,000 tons of sand tails.

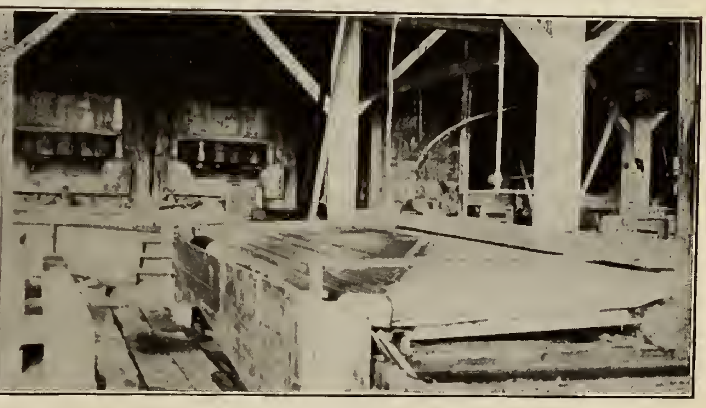
The shipping of mine slimes without treatment in the mill brings down the concentration ratio very considerably; but experience has shown that it is not advisable to mix these slimes with the lower grade slimes from the stamps. At present from 30 to 40 tons of the mine slimes per month is being shipped.

An especially interesting feature of the Coniagas mill is the great increase in efficiency of the Deister tables resulting in modifications introduced by Mr. Fraser Reid. The table deck has been changed from the standard type to one that not only does the work better, but is also much simpler in construction. Run in competition with other tables the superiority of Mr. Reid's modified deck has been conclusively proved. The concentrate produced by the new style table is said to average about 1,000 ounces, while that from the old style was 300 to 500 ounces.

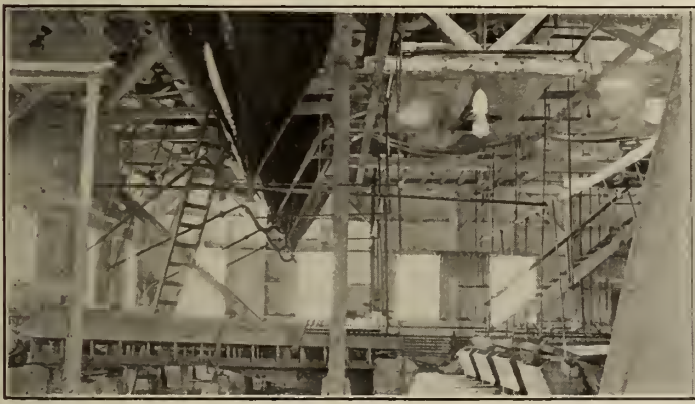
The mining company's report for the year 1910-1911 shows that during that period the mill crushed 52,320 tons of ore, an average of 169 tons per day and shipped



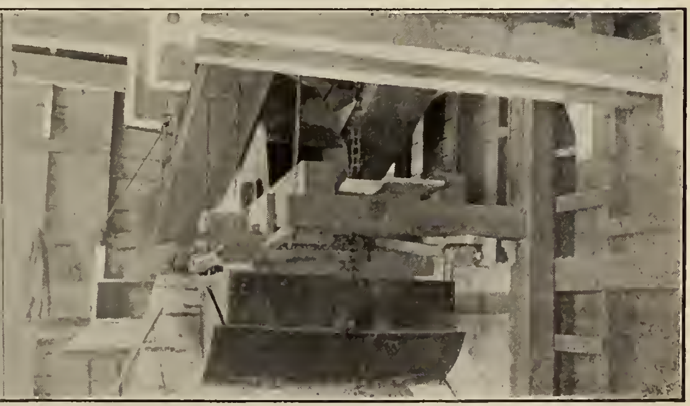
**Wilfley tables, Callow tanks, and Frue vanners, Northern Customs mill**



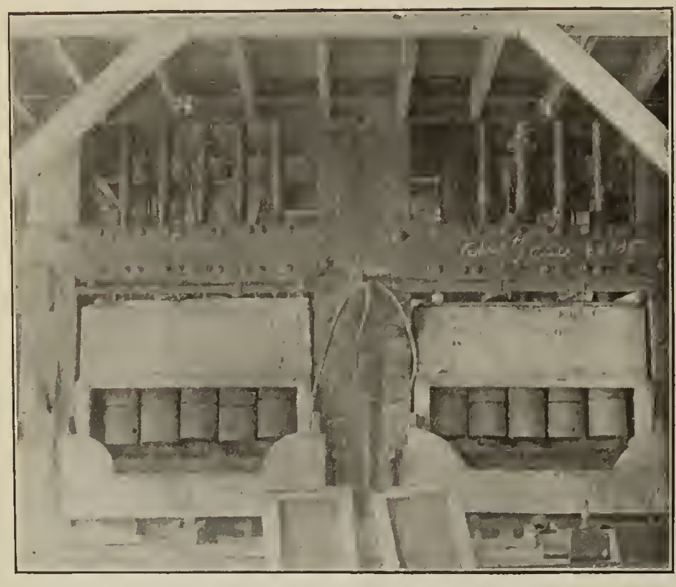
**Stamps and Wilfley tables, Northern Customs mill**



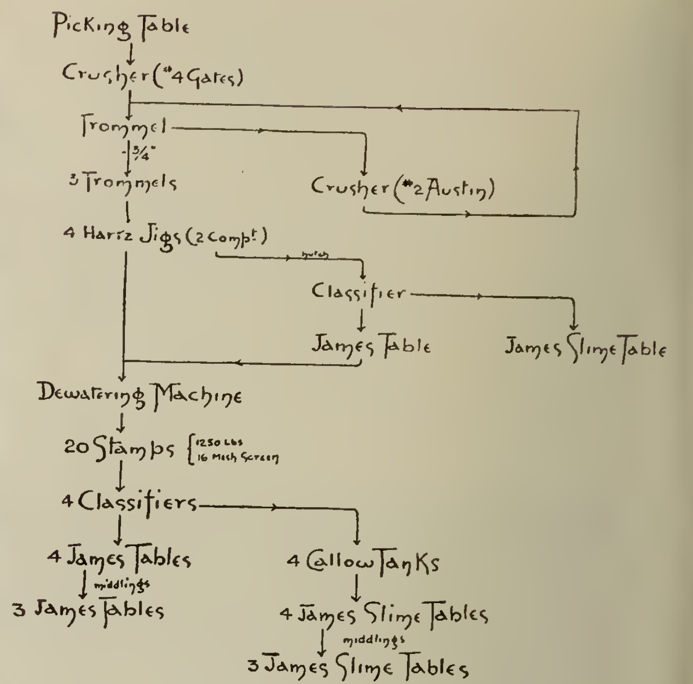
**Tanks and tables, Beaver mill**



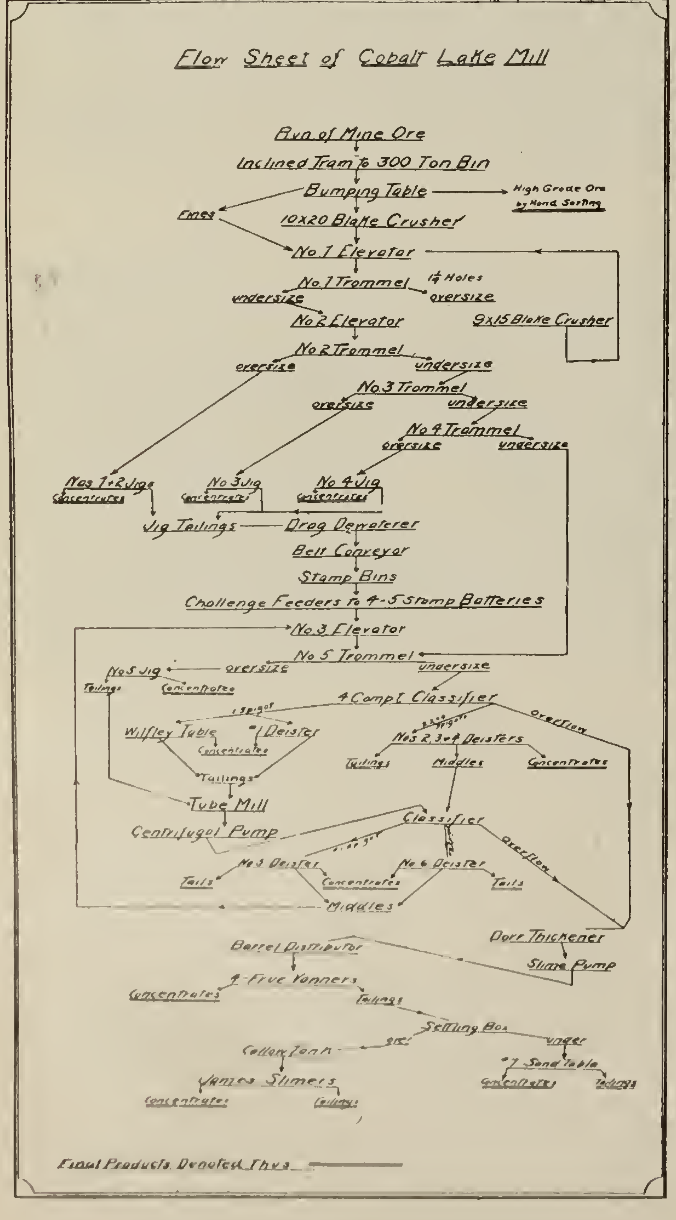
**Skip and weighing bucket, Northern Customs mill**



Stamps, Northern Customs mill




FLOW SHEET, HUDSON BAY CONCENTRATOR.




1,418.4 tons of concentrates containing 1,643,616 ounces of silver. The recovery was about 87 per cent. Sand tailings, containing 4 to 8 per cent. slime, averaged 3.8 ounces silver per ton. Slime tails, 85 pér cent. of which was 200 mesh or finer, averaged 6.6 ounces silver per ton.

### Hudson Bay and Cobalt Lake Concentrators.

The method of treating ore at the Hudson Bay and Cobalt Lake Mills is indicated by the accompanying flow sheets, the first taken from Mr. A. A. Cole's report and the second from the Mining Company's annual report. These two plants are among those most recently constructed.

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## Armstrong Whitworth Company to Have Canadian Branch Plant.

It is announced that a site has been secured on the south shore of the St. Lawrence River, within Montreal harbour, by the well-known English company, Sir W. G. Armstrong Whitworth & Co., Ltd. A plant to cost about $1,000,000 will be erected for the manufacture of machinery, tool steel, etc. It is not intended that the Canadian branch will do any military or naval work.

The credit of bringing this new industry to Canada is said to be largely due to M. J. Butler, formerly general manager of the Dominion Steel Corporation and to Sir Percy Girouard, who is a director of the English company.

The announcement, coming while the United States Steel Corporation is establishing a branch plant at Ojibway, Ontario, indicates clearly that English steel makers, as well as those of the United States, believe that Canada offers a profitable field for investment. Armstrong Whitworth & Co. on May 31 announced an issue at par of £1,000,000 five per cent. shares. This is supposedly made to finance the Canadian undertaking; but the company's circular does not state the purpose of the issue.

# GEOLOGICAL SURVEY FIELD WORK IN 1913

Owing to the meeting of the International Geological Congress in Canada this year, the field work of the Geological Survey will be somewhat curtailed, as many of the officers are required for the work of the Congress, but as will be seen from the following programme of field operations, its work will still be comprehensive and extensive. Most of the parties have left for their respective fields.

### Canadian Arctic Expedition.

On the Canadian Arctic Expedition of V. Stefansson, George Malloch will be geologist and geographer for the Northern party, which will explore the unknown seas and lands north of the mouth of the MacKenzie and west of Banks and Prince Patrick's Land.

For the Southern party the following officers have been detailed: R. M. Anderson, zoologist; K. G. Chipman, geographer; J. R. Cox, assistant geographer; J. J. O'Neill, geologist; H. Beuchat, ethnologist; D. Jenness, ethnologist.

The Southern party will investigate the region about Coronation Gulf, including the Coppermine River basin and Victoria Land. The occurrence of copper-bearing rocks in this region makes the geological examination and mapping of great importance. The copper companies are interested in the possibilities of the region, as there are no physical difficulties that would prevent mining. Geological and geographical data are required for the guidance of prospecting for copper in this territory. Should copper be discovered in commercial quantities it would mean the opening up, by transportation, of the whole MacKenzie River valley and the Arctic Coast.

## GEOLOGICAL SURVEY FIELD PARTIES IN OTHER PORTIONS OF THE DOMINION.

### Geological Division.

### Maritime Provinces.

Bell, W. A.—Areal mapping of the Windsor and Horton series in an area comprising about 200 square miles, in the vicinity of Windsor, designated the Windsor map.

Faribault, E. R.—Revision and completion of the geological mapping of the western portions of Sheets 94 and 95, Lunenburg County. Completion if possible of Geological Sheets 91 and 92, Shelburne and Queen's Counties.

Goldthwait, J. W.—Investigation of the glacial features and physiographic history of Nova Scotia. General examination of sand, clay and gravel deposits not hitherto reported on.

Hayes, A. O.—Areal mapping (geological) of the St. John Sheet.

Hyde, J. E.—Continuation of investigation of the Carboniferous areas of Nova Scotia.

Wright, W. J.—Areal mapping (geological) of the Moncton Sheet. Preliminary examination of geological sections at Dorchester and Joggins.

### Quebec.

Harvie, R.—Completion of the mapping of the geological sections between Knowlton Landing and Cowansville. Completion if possible of Orford map.

Mailhiot, A.—Detailed petrographical and mineralogical investigation of the granitic areas of the Eastern Townships, which may contain gold, scheelite and tinstone(?).

Keele, J.—Continuation of the investigation of the clay deposits of Quebec.

Stansfield, J.—Completion of field work between Quebec and Mattawa, including the survey of the raised beaches on the Island of Montreal.

Wilson, M. E.—Areal mapping (geological) of the Buckingham Sheet (apatite, mica, graphite area).

### Ontario.

Barlow, A. E.—Detailed investigation of the corundum deposits at and near Craigmont.

Collins, W. H.—Completion of areal mapping (geological) of the Onaping Sheet (139). Commence revision of Sudbury Sheet.

Johnston, W. A.—Areal mapping of the calcareous drift which forms the valuable agricultural lands northwards from the International Boundary.

Taylor, F. B.—Continuation of investigation of glacial drift forms in Southwestern Ontario.

Uglow, W. L.—Completion of work between Port Arthur and Fort Frances, Can. Nor. Ry.

Williams, M. Y.—Continuation of investigation on the Silurian of Southwestern Ontario.

### Manitoba.

MacLean, A., and Wallace, R. A.—Investigation of the gypsum, anhydrite and associated beds of the Gypsumville districts and the beds furnishing the saline springs along the west shore of Lake Winnipegosis and of the phosphatic shales west of the Winnipeg Lakes.

### Saskatchewan.

Rose, B.—Completion of field work between Banff and Golden. Preparation of guide book of the Rocky Mountain Park at Banff.

Cairnes, D. D.—Areal mapping (geological) of the White River copper district. Examination and immediate report on the copper deposits of Valdez Island. Reconnaissance of the placer area southeast of Teslin Lake.

Camsell, C.—Reconnaissance in the Similkameen district.

Clapp, C. H.—Completion of areal mapping (geological) of the Duncan Sheet and the Sooke Special Sheet, Vancouver Island. Examination of alunite deposits on Kyuquot Sound, V.I.

Drysdale, C. W.—Completion of investigations of the gold-copper deposits of Rossland, including the South Belt.

Leach, W. W.—Examination of area being investigated for oil, Sheep Creek, Alta. Completion of areal mapping (geological) of Flathead Special. Commence areal mapping of Crow's Nest Sheet.

McConnell, R. G.—Examination of copper deposits at Granby Bay and Britannia. Reconnaissance of copper-bearing area of Rainy Hollow.

MacKenzie, J. D.—Areal mapping of the coal measures of Graham Island.

Ries, H.—Continuation of the investigation on the clay deposits of Western Canada.

Schofield, S. J.—Completion of areal mapping (geological) of East Kootenay sections, extending them to Kootenay Lake. Completion of geological section at Elko.

Whittaker, E. J.—Examination of geological sections of Mesozoic formations along Old Man River and Race Horse Creek, Race Horse map area. Preliminary examination of Cretaceous sections in escarpment west of Dawson Bay, Lake Winnipegosis.

### General Work.

Burling, L. D.—Collection of fossils, with the assistance of W. D. Matthews, from Matthews type localities in the Cambrian near St. John, N.B. Study sections which may be expected to afford data for the proper correlation of the constituent parts of the lower portions of the Quebec group. Stratigraphical palaeontology of section north of Yukon River, along 141st meridian.

Daly, R. A.—Field work between Golden and Vancouver.

Dowling, D. B.—Review coal development in Western Canada.

Kindle, E. M.—Examination of sections of the Devonian and Silurian in Quebec, New Brunswick and Nova Scotia. Supervision of certain stratigraphical palaeontological field parties.

LeRoy, O. E.—General supervision of field parties. General Congress work. Act as guide on C-2 Excursion (I.G.C.).

Young, G. A.—Supervision of certain eastern field parties.

Lambe, L.—Examinations of beds containing vertebrate remains in Western Canada.

Ingall, E. D.—Examination of bore holes, Ottawa and vicinity.

### Topographical Division.

W. E. Lawson, White River District, Yukon; S. C. McLean, Similkameen District, B.C.; A. C. T. Sheppard, Crow's Nest Map-area, B.C.; A. G. Haultain, Windermere Map-area, B.C.; E. E. Freeland, Lillooet Map-area, B.C.; F. S. Falconer, Flathead and Sooke Map-areas, B.C.; D. A. Nichols, Thetford Map-area, Que.; B. R. MacKay, Pictou Map-area, N.S.

The Anthropological and Biological Divisions of the Geological Survey will also have parties in the field.

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# THE HARRIS MINES, NEAR HAZELTON, B.C.

By E. Jacobs.

Now that the Grand Trunk Pacific Railway has been constructed through the Hazelton district of Omineca mining division, more mining development work is being done in that part of the Skeena River country than was practicable at reasonable cost when the district was entirely without railway transportation facilities. In a recent number of the Omineca Herald, published at New Hazelton, there was printed some information designed to show what progress had been made in the development of the American Boy group, now known as the Harris Mines.

The Hazelton district was visited in the summer of 1911 by Mr. Wm. Fleet Robertson, Provincial Mineralogist for British Columbia, who, as he stated in his published report, "proceeded to examine the various mineral claims in the district within possible reach of the approaching railway transportation." The report on the numerous claims examined is contained in the "Annual Report of the Minister of Mines, 1911," which may be obtained on application to the Department of Mines, Victoria, B.C. (until out of print). The two sketch maps prepared to illustrate the report on parts of the Omineca and Skeena country are useful, for they give an excellent outline of the districts concerned. So that the impressions of the Government official of what he saw may be placed at disposal of readers, extracts have been made below from his report, and these are followed by the first above-mentioned particulars from the Omineca Herald. It should be kept in mind that the information quoted from the Provincial Mineralogist's report relates to what he saw two years ago, while the newspaper account gives particulars of the conditions after much development work has been done.

### Two-Mile Camp.

Under this heading the Provincial Mineralogist reported, in part: "The American Boy group, consisting of eight claims, owned by Harris Bros. and Mullen, of Hazelton, is situated on the eastern slope of Two-mile creek at an elevation of about 3,200 ft., and distant from Hazelton, by the trail, some seven miles.

"The camp and the various workings are on an easily sloping bench on the eastern side of, and several hundred feet higher than, the valley of Two-mile creek, in a dense growth of large hemlock, spruce, and balsam timber. The camp consists of a very good log-cabin with tents.

"The development of the property has been done by the owners, with little outside assistance, and is made up chiefly of stripping trenches in surface soil, uncovering the veins, and two small shafts.

"There are at least three parallel veins shown by the work done, and these are all of about the same general character, having a general north-and-south strike and a steep dip.

"No. 3 vein is probably the most promising and has received the most development; it occurs on a very easily-sloping hillside at an elevation of 3,200 ft., having been developed by an inclined shaft sunk 25 ft. in an argillite country-rock, and shows a very well-defined quartz vein, averaging about 24 in. wide, containing a heavy percentage of galena, with some zinc-blende, iron-pyrites, and arseno-pyrite. The vein has a strike approximately north and south and dips about 75 degrees; it is very regular and continues, as has been proved, for some distance.

"An open-cut about 20 ft. to the north of the shaft exposes the vein for a length of 10 ft., in which the vein shows clearly about 27 in. of white quartz with, disseminated through it, bunches and stringers of galena, etc.

"In the shaft, a few feet underground, there appears on the hanging-wall a light-coloured dike which did not show in the surface workings. The vein, as exposed in shaft, continues quite as strong to the bottom, varying somewhat in its width, but maintaining an average of 24 in. The mineralization in the vein also remains strong to the depth shown.

"As indicating the proportion of ore in the vein, it was noted that there was a pile of ore on the dump, amounting to about 30 tons, taken from the shaft in sinking the 25 ft. A sample taken by the writer, as roughly representing this ore-pile, assayed: Lead, 11.5 per cent.; silver, 138 oz., and gold, 0.2 oz. to the ton. A second sample taken of the ore in another vein on the property assayed: Lead, 48 per cent.; silver, 125 oz., and gold, 0.02 oz. to the ton.

"No. 2 vein is a couple of hundred yards down the hill from No. 3, and has been exposed by stripping and open-cuts for several hundred feet, which show it to be unusually regular and persistent, having a strike of N. 40 deg. W. and a dip of about 80 degrees to northeast, with a width of from 2 to 3 ft. The vein-filling is white quartz containing galena and a little zinc-blende, pretty generally disseminated through the vein, but in variable amounts at different places. The ore does not occur in a sufficiently concentrated form to be shipped direct, but would make a good concentrating ore.

"No. 1 vein lies still farther to the south, having about the same strike and dip as has No. 2 vein; it is some 3 ft. wide and has been traced by stripping for from 300 to 400 ft.; the vein-matter and mineralization being similar to No. 2 vein.

"A shaft has been sunk on this vein for a depth of 35 ft., and it is reported that a drift 20 ft. long has been made at the bottom, but as the shaft was partly filled with water, this could not be seen.

"The property is one of much promise as a concentrating proposition, and is ideally situated for cheap mining. When the development in the present location at the outcrops shall justify it, an adit can be driven from the valley of Two-mile creek, where the plant would be situated and all the ore brought out."

**A Present-Day Account.**

The following account of the development, etc., of the property, as at May 24, has been published in the Omineca Herald, admittedly by a firm having for its object the sale of shares in the Harris Company, to provide money for continuing development and making an output of ore:

"No. 1 vein opened by shaft 100 ft. deep in ore. Drift north 40 ft., on ore from the 100-ft. level. Ore along this drift is not of shipping grade, but vein and size of orebody all along very strong. At 80 ft. farther to the north on surface this vein is 3 ft. wide, with 16 in. of solid clean shipping ore averaging $90 per ton in silver and lead. The drift will be driven on the 100-ft. level to this point where it is reasonable to suppose a fine shoot of ore will be encountered.

"No. 2 vein opened by a crosscut tunnel 360 ft. long and taps the vein at 120 ft. depth. Drifting 45 ft. determines that the vein is badly broken at this point, but very high-grade ore in spots. Engineers advise active prosecution of work on this vein.

"No. 3 Vein.—Incline shaft to 19-ft. level. Vein and ore strong and continuous all the way down; ore averaging $100 per ton, varying in width from 6 in. to 3 ft. Drift off the 190-ft. level north is now in 170-ft. Shoot of extremely high-grade ore encountered at this point in the past week. The shoot is now 2 ft. 6 in. wide in the face, with 14 in. of solid clean galena streaked with grey copper averaging $300 per ton, while the remainder of the vein averages $155 per ton. From a point 75 ft. north in this shaft a fine shoot of ore was encountered which is continuous to date. The first carload of ore was shipped to the smeltery at Trail from this shoot in the past month and the net returns were $73 per ton, or $2,190 for the 30 tons. Another carload is about ready and will be shipped from New Hazelton in a short time. A drift run south on this same level shows the vein and ore of the same high-grade character as in the north drift. A drift was also run north from the 100-ft. level a distance of 90 ft. and shipping ore was continuous. A particularly fine shoot was encountered at a distance of 70 ft.

"No. 4 vein has been opened by surface cuts along the length of the vein and shows ore of equally good shipping grade as No. 3 vein.

"No. 5 Vein.—Open-cuts and surface stripping show much the same as Nos. 3 and 4. In spots the ore is of the highest value yet discovered. This will be opened by incline shaft this summer.

"The company owns eight adjoining claims (400 acres) and much of the surface has not been thoroughly prospected.

"All work to date has given good results. The high grade of the ore, continuity of the veins, and uniformity of the orebodies have satisfied practical mining men of the district that this property will be a good producer and a profit-maker. The depth at present obtained—about 200 ft.—has proved that the orebodies are larger and richer than at the surface, and such marked improvement at depth as a general rule insures the life of the ore.

"The total expenditure to date has been $19,000; some 1,500 ft. of development has been done. In addition, much surface prospecting has been done, and cabins, bunkhouses, etc., have been built. The four Harris Bros. have given the best part of two-and-a-half years to the property, besides having employed miners at wages. . . .

"To develop the mine further, by sinking another 100-ft. on the proved orebodies, it will be necessary to use machinery. To purchase this machinery and to defray the cost of sinking 100 ft. deeper, 100,000 shares of treasury stock are to be offered to the public. With the proposed work accomplished and a similar grade of ore at depth, the mine will be in a fair way toward becoming a dividend-payer. The profits from the ore from the drifts and stopes will, from now on, be used to further develop Nos. 1, 2 and 5 veins. The net proceeds from each car should average $2,000, taking the net profit from the first 30 tons as a basis. In view of the recent strike of high-grade ore the average may run much higher. . . ."

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**The McGillivray Creek Coal and Coke Company,** operating a colliery at Carbondale, near Coleman, Southwest Alberta, held the annual meeting in Spokane, Washington, on June 5th. Officers and directors were re-elected, as follows: Lorne A Campbell, Rossland, B.C., president and general manager; James A. Nowell, Spokane, vice-president; W. E. Cullen, Spokane, secretary-treasurer. These, with P. M. Paine, Glencoe, Minnesota, and Fitzhugh Burns, St. Paul, Minnesota, constitute the directorate. Official reports presented at the meeting indicated satisfactory conditions at the mine, from which coal is being shipped regularly. Plans for increasing the output are under consideration.

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**The Standard Silver-Lead Mining Company,** operating the Standard mine and concentrating mill near Silverton, Slocan Lake, B.C., for the calendar year 1912 reports as follows: Receipts: From 9,703 tons of silver-lead ore and concentrate shipped, $680,000; from silver-zinc concentrate, $41,340; from Government of Canada, bounty on lead produced, $20,240; from boarding house receipts, $16,500; total, $758,080. Disbursements: For supplies, $85,820; for labour, $113,954; balance, being net profit for year, $558,306. Dividends paid to shareholders totalled $425,000, leaving balance on hand, $133,306. The directors and officers of the company for the current year are: W. J. C. Wakefield, president; John A. Finch, vice-president; Chas. Hussey, secretary-treasurer; Geo. H. Aylard, manager, and P. Clark.

# A MACHINE-DRILL COMPETITION

A unique contest, in which teams from most of the copper mines in Michigan took part, was held at Calumet on August 23, 1912. The competitors used only drills made by one firm—and the contest was chiefly in speed of rigging up the machines. After rigging up the miners turned on full air for 2 minutes, and then turned it off and changed steel. No account was taken of the depth of the hole bored, and the prizes went to the team that took the shortest time for the complete operation.

Owing to the large number of contestants two blocks of granite were used, and the drills rigged up on opposite faces. In this way four faces could be used at once. The rules of the day were as follows:

1. Only one entry will be accepted for each contest, from each mine.
2. Complete outfit to be placed 10 ft. from place of rigging.
3. Nuts on clamp and arm to be even with the bolt, at the start.
4. One standard wrench to be used.
5. A 50-ft. length of hose coiled, one end connected with the air supply.
6. Both chuck bolts to be tightened.
7. Jack screws to be flush with bottom of jack, at the start, and collar to be stationary on the post.
8. Each contestant to rig up, turn on full air, and run his drill 2 minutes and change steel at the finish and tighten both chuck bolts.
9. Numbers will be marked on rock and cap and contestants will draw for position and place in contest.
10. Machines, drill steel and hose and complete equipment will be furnished.
11. The drilling will be on flat, dry holes.

Provision was made for 1-man and 2-man contests. Two men rigged up a Rand 3 B and one man a C 113 Butterfly machine. The Ingersoll-Rand Company donated three prizes of $100, $50 and $25 for each class. The Calumet and Hecla Mining Company furnished compressed air delivered at the drills at about 85-lb. pressure. The accompanying photographs show how the frameworks for the granite blocks were constructed.

**Drilling Contest, Calumet, Mich,**

Thirty-eight teams were entered.

The 1-man contest was won in 4 min. 33 sec., and the 2-man in 3 min. 42 sec.

After the rigging-up contests a match between a machine drill and two hammers and drill, resulted in a victory for the machine. The hand-drillers made 49 ins. in 15 minutes. The machine-drill made over 50 ins. in 14 minutes.

The rules for this match provided that each competitor should drill for 15 minutes, in a block of granite, but the machine operator pierced the block before the expiration of the time allowed.

The hand drillers started with a 1¼-inch bit and finished with a ¾-inch. The machine operator started with a 2-inch and finished with a 1⅛-inch bit.

# PERSONAL AND GENERAL

### MR. E. T. CORKILL, INSPECTOR OF MINES, RESIGNS TO TAKE POSITION WITH CANADIAN COPPER COMPANY.

The Canadian Mining Journal has recently learned of the resignation of Mr. E. T. Corkill, Chief Inspector of Mines for the Province of Ontario, during the past nine years. The resignation comes as a result of the inauguration by the Canadian Copper Company of a new policy in connection with their mines and metallurgical plants, whereby the company creates the position of safety engineer, which is to be filled by Mr. Corkill.

There is without doubt no man who has such an intimate knowledge of the mines of Ontario, and at the same time, of the great nickel deposits of the Sudbury area. The Canadian Copper Company would go far afield before securing a more capable, efficient and energetic official than the former inspector of mines. Aside from the pecuniary benefits which will certainly accrue to this great company, the humane and laudable efforts to decrease the number of accidents, and to inculcate methods of safety among the employees will meet with the hearty approbation of the responsible mining fraternity and the general public.

Mr. Corkill, who has won the respect of the mining men of Ontario, has made a host of friends in the north country, and filled the difficult positon of inspector of mines with firmness and dignity. To criticize, without arousing antagonism, the mining method of men who were often much older and more experienced than himself, required the possession of rare tact and good judgment. With these qualities Mr. Corkill is endowed.

Born in Frontenac County, Ontario, in the year 1880, it was perhaps natural that Mr. Corkill should take kindly to the mining profession, since that country is unsurpassed for the quality of its mica and feldspar, and is the seat of the well-known School of Mining at Kingston. He received his early education at the Sydenham High School, from which he matriculated in 1897, entering the School of Mining, Kingston, three years later. Fitted by temperament and physique for the onerous work of mining engineer, he early entered with enthusiasm into the spirit of his profession. Part of his college course was under the guidance of Willet G. Miller, who was then professor of geology at Queen's University. In 1904 Mr. Corkill received the degree of B.Sc., and the following year the degree of mining engineer. During his undergraduate course he gained considerable experience while working in the summer months for the Canadian Copper Company and the mines department of the General Electric Company. After graduating in 1904 he was appointed superintendent for the General Electric Company's mica mines in New Hampshire, which position he held until appointed in 1905, by the Ontario Government, to the important post of inspector of mines for the Province and later chief inspector. The latter appointment he has held continuously up to the present time.

The Ontario Government loses a valuable official, and it is certain that Dr. Miller, the Provincial geologist, and Mr. Gibson, the Deputy Minister of Mines, will keenly regret his departure, while, at the same time, wishing him success in the larger field he has entered.

It is regrettable that the salaries of Government officials cannot be raised to correspond with increased usefulness of the men. A large fund of information gathered during several years of careful observation, and invaluable on many occasions is lost to the country because of the policy of making the compensation for faithful service so small that the men are attracted by numerous better offers from outside, and eventually leave the service.

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D'Arcy Weatherbe announces that he has withdrawn as partner from the firm of Bainbridge, Seymour & Co., and has taken offices and will continue practice at 62 London Wall, London, E.C.

Mr. C. W. Meek, superintendent of the Dome Mines, has left for a trip through the States and to California which will take about three months. His place is being looked after by Mr. De Pencier, of Copper Cliff. Mr. Hansen, who resigned as mill superintendent, has also gone to the States. His position was taken by Mr. J. Longworth.

Mr. John S. MacLean has been appointed to take charge of the publicity and advertising work of the Canadian General Electric Company, Limited, and of the Canadian Allis-Chalmers, Limited, with headquarters in Toronto. The latter company, in addition to manufacturing an extensive line of machinery and appliance, will also act as sales agents for all the products of the Canada Foundry Company, Limited. Mr. MacLean held a similar position with Allis-Chalmers-Bullock, Limited, for a number of years.

Mr. C. Ivan Murray, B.Sc., McGill, has accepted a position as metallurgical engineer with the Pittsburg Electric Furnace Co., Pittsburg.

The Sullivan Machinery Co. have just published three new bulletins, No. 38-M, No. 66-M, and No. 112, describing different types of air compressors and hammer drills.

Mr. Frank Loring has returned from a trip to Western Ontario.

It is reported that the Mond Nickel Company has taken over the old Worthington nickel mine in the Sudbury district.

Mr. D. W. Brunton, of Denver, Colorado, has been on a visit to his son, Mr. Frederic K. Brunton, who is assistant superintendent at the British Columbia Copper Co.'s smelting works at Greenwood, B.C.

Mr. Chas. A. Banks, manager for the Jewel & Denero Mines, Ltd., operating a gold mine and stamp-mill in Long Lake Camp, Boundary District of British Columbia, has returned from a visit to England.

Mr. T. Walter Beam recently returned to Denver, Colorado, from the Similkameen district, B.C. He is prospecting with the diamond drill a group of mineral claims in Hedley camp, Similkameen.

Mr. J. J. Campbell, of Nelson district, British Columbia, who some years ago was commercial manager for the Hall Mining and Smelting Co., with his fellow-members of the British Columbia Agricultural Commission, travelling about that Province obtaining information relative to its agricultural industry.

Mr. Chas. H. Clapp, of the Geological Survey of Canada, is reported to have accepted a position on the Faculty of the School of Mines of the University of Arizona at Tucson, Arizona, U.S.A.

Mr. A. W. Davis is now in charge of mining operations at the Consolidated Mining and Smelting Co.'s No. 7 mine, in Boundary district, B.C.

Mr. James Finlay, for several years actively connected with the management of the Sullivan mine and smelting works in East Kootenay, B.C., is now manager of the Maple Leaf coal mine, near Frank, Southwest Alberta.

Mr. Albert I. Goodell, formerly manager of the copper smelting works at Boundary Falls, B.C., and afterwards of the Le Roi Mining Co.'s smeltery at Northport, Washington, is now manager for the Idaho-Continental Mining Co. He represents the Ryan interests, which have advanced the company $325,000 for expenditure on development of its mine and equipment of its concentrator, situated about 26 miles from Porthill, Idaho. Latterly, Mr. Goodell had been district representative of the International Smelting and Refining Co., and had made Spokane his headquarters.

Mr. A. L. Gatsinger, of New York, is spending some time on the property of the Dividend-Lakeview Consolidated Gold Mining Co., Ltd., on Dividend Mountain, Osoyoos mining division, British Columbia, in which developing property he is interested.

M. Beatty & Sons, Ltd., will be represented in Toronto by H. W. Petrie, Ltd.

Dorothy China Clay Pit, St. Stephens, Cornwall, England

## THE CORNISH CHINA CLAY INDUSTRY.

Kaolin, as it was called, was first used by those ingenious people of China in the manufacture of their own domestic vessels, but those who were better skilled in this crude art, made finer specimens which they exported. The secret of this ancient industry was well kept for many generations, until it was unravelled by some missionaries, who were travelling in the Celestial Empire. The ware took its name from the country of its origin and when the raw material was eventually discovered by William Cookworthy in the St. Austell or Mid-Cornwall district in the year 1755, the original name was still retained. Kaolin or China clay is the result of the partial decomposition of granite rock and one of the most remarkable and interesting features is that whereas there are many plastic clays derived from other strata, yet none of these can be employed for the purposes for which pure clay or kaolin is most essential. Such clays are, however, used in large quantities for the manufacture of earthenware pipes, floor-tiles and coarser kinds of pottery.

Kaolin is derived from feldspar, one of the principal constituents of granite. The granite disintegrates and the feldspar becomes decomposed, and thus the substance called kaolin is originated.

When it is considered that only two generations ago, less than 1,000 tons of China clay were produced in Cornwall and the output last year amounted to considerably over 900,000 tons, one has some conception of the advance made in recent years of this great Cornish industry. Of this vast production about two-thirds is used in the great paper manufactories of the world.—Pulp and Paper Magazine.

# SPECIAL CORRESPONDENCE

## COBALT, SOUTH LORRAIN AND GOWGANDA.

**The May production of McKinley-Darragh-Savage Mine** reached a total of 206,781 ounces, which showed an increase of more than 40,000 ounces over April, and is the highest for the present year. The increase in production was partly due to a better grade of ore being treated and partly to the starting of the new mill extension. Of the total ounces produced only 42,662 ounces came from the Savage mine. 75 tons daily is being transported from the Savage by the aerial tramway to the McKinley concentrator. This ore is being taken from the Savage dumps. A total battery of fifty stamps is now in operation.

**The production of the Cobalt Townsite** for the two weeks ending June 7th was 81,900 ounces. The production of the Casey Cobalt for the same period was 40,400 ounces.

**The Cobalt Lake Mining Company** this month went on a regular production basis of 35,000 ounces. All forty stamps are now dropping in the mill and about 150 tons are being treated daily. The plant has a capacity of about 175 tons daily, which will probably be reached shortly. Underground some high grade ore has been discovered in what has been called No. 1 vein. It is most probably a continuation of one of the best producers of the Cobalt Townsite, and has been opened up within a few hundred feet of the Townsite extension line. There is a continuous shoot of high grade ore for ninety feet on this vein, and it promises to be one of the most important on the Lake property. A considerable tonnage of ore is being run through the mill from the dump at No. 6 shaft.

**The King Edward**, another old mine, once abandoned, is showing up well. It is leased and operated by the York Ontario. The general manager, Mr. Jackman, reports to shareholders that since February the developments at the mine have been satisfactory. Silver ore has been found on numerous veins. This ore varies from small veins of high grade ore to several feet of milling ore. At the end of April it was reported that there was on hand about 7 tons of high grade silver ore assaying about a thousand ounces to the ton and about 3 tons of second grade assaying 200 ounces to the ton. Three drills are working in the mine and the small plant is treating ore at a customs rate of $3.00 per ton.

**The Meteor Mining Company** is now working again. Some years ago this company bought the Powell claim on Diabase Mountain and ran a tunnel for some distance into the side of the hill. From this tunnel a shaft was sunk 100 ft. Work is being resumed at this point.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE.

**The strike at Porcupine is virtually over.** Twice it was brought forward at the union meeting that the strike should be declared off, but on both occasions it was decided that it should be continued. At the last meeting, however, it was felt by the leaders that they could no longer hold their men, and while they did not declare the strike off they gave the union men permission to seek work. This they did with alacrity. The married men went the rounds first; and after they had had a chance to secure berths, the single men followed. Any company in Porcupine that desires to work can now get a full complement of men.

Upwards of a thousand men went on strike last September, but not a third of these were in camp when the strike virtually ended. For the past two months they have been drifting out of camp to other Northern Ontario fields, to Cobalt, and to Kirkland Lake and Swastika. Some dozen of them accepted government work on the Kirkland Lake road at two dollars a day and board.

The strike began last September with the determination of the McEnaney, Jupiter, Plenaurum, McIntyre and Vipond to cut wages, owing to better conditions prevailing in the camp. A conciliation board was formed and heard evidence. The strike followed when the award was made, the men refusing to accept it. It has been attended with more violence than is usual in a Canadian strike, although no one has been seriously injured. For instance, the last Hollinger report chronicles the fact that one of the houses of the shift bosses had been burned down and when investigation was made it was found to have been sprinkled with petroleum.

Now that the strike is virtually off, the camp has already begun to show signs of mending. The mines that fought the strike have, as a matter of fact, been steadily improving; but many in the prospective stage decided that it would be more advantageous to shut down till the strike was over rather than to incur the expense of fighting it. These will now start up again almost at once. The industrial conditions in the Porcupine camp have been subjected to a unique succession of disasters. There was first the big fire which swept out of existence the work of a busy six months. the boom that followed it was almost as disastrous since it was inevitably followed by a depression, then just as business was picking up again in the various settlements the strike arrested progress again. Now it would seem there is again a clear sky and the camp should be in a good position in every respect in the fall.

**Hollinger May Report.**—Owing to the fact that the mill only ran 49 per cent. of the time possible for the four weeks ending May 20th the net profits for the Hollinger Gold Mines were only $48,611.34. Mr. P. A. Robbins gives the cause as due to a total shut down of power for twelve days, owing to mishaps at the power plants in the camp. However, conditions are again normal, and the mine and the mill producing satisfactorily.

The profits from the first of the year to May 20th are $598,505.70.

Mr. P. A. Robbins' report says, in part: During the shut down the mine was operated at reduced capacity by means of steam-driven compressors and the development ore was not hoisted from the mine until the resumption of milling operations. In order to get the mine clear it was necessary to mill this development rock when milling operations were resumed and the month's operations, therefore, show a falling off in grade as well as a great reduction (one-half) in tonnage treated. Having milled only 50 per cent. of the usual output, and having been put to a heavy policing cost, it will be understood that the total costs per ton are of necessity abnormally high, but the present period will show a reduction in costs to a figure considerably below those previously published. The approximate average value of all ore hoisted was $17.53 per ton. Mining costs:

| | |
|---|---|
| Production .................... | 3.506 per ton milled. |
| Exploration .................... | $0.227 per ton milled. |
| Development .................. | 0.745 per ton milled. |
| Total ........................ | $4.478 per ton milled. |

The mill treated a total of 6,560 tons, average value of ore treated $17.53 per ton., approximate extraction 95 per cent., milling costs $2.280 per ton milled.

**Goldfields, Limited.**—Forty stamps are dropping in the mill of the Goldfields, Limited, at Larder Lake, some eighty tons per day going through to the tables. Tube mills have been ordered and a cyanide plant will be installed with the intention of increasing the capacity very largely and also the extraction, which by the simple amalgamation now in vogue is not high. All the ore is coming from a "glory hole," the mining being very expensive. The ore body is large, but the grade is very low. The shaft is now being put down another hundred feet, and the open cut will be carried through.

**At the Mine d'Or Huronia**, a Montreal property, situated halfway between Larder Lake and the Kirkland Lake section a compressor plant and boilers are being set up. The company has a ten-stamp mill; but it has not been set up yet nor are the foundations in. While there is a good surface showing there is practically no underground development work done.

**At the Hughes Porcupine** the small mill is now running after a stoppage of two months and a half. The first bar was melted on the property last week. A vein has been struck between the 200 and 300-foot levels, and is said to be good ore.

**At the Teck Hughes, Kirkland Lake,** the compressor plant is now running. The shaft will be put down to the 100-foot level before any cross-cutting is attempted.

**The Government Road.**—Good progress is being made with the work on the Government road between Swastika and Kirkland Lake. 150 men are employed and the right of way has already been cut as far as Gull Lake. It is the intention of the Government to put in an excellent road and an appropriation of over $3,000 a mile has been made.

Prospectors have this year been more active than for several springs past, but are being driven out of the woods by the flies, which are this season unusually severe.

## NOVA SCOTIA.

**Dominion Coal Outputs.**—The output of the Glace Bay mines for June will be about 395,000 tons. This will be slightly in excess of June last year. Outputs are a little restricted by a shortage of labour, the supply not being quite equal to the rapid expansion of the mines. A large number of men returned to Europe at the outbreak of the Balkan War, and none of these have returned. If the long-promised demobilization of troops takes place no doubt men will commence to come back, but in any case immigration from Southeastern Europe will be small for a long time to come.

No. 11 Colliery, which was unwatered only in April, is now producing an output of almost 200 tons daily. The unwatering of No. 17 Colliery is proceeding satisfactorily, but it is not likely that this mine will be a producer until next year.

The No. 2 Bankhead of the Nova Scotia Steel Co. was destroyed by fire in the middle of the month. The restriction of output caused by this mishap will be very small, as the hoisting arrangements were only slightly damaged. The bankhead was a wooden one of old design, and fully covered by insurance.

The Cape Breton Coal Iron & Railway Co. are now producing a small output from the Broughton mine. It is understood that orders have been passed for coal cars and locomotives, and some small shipments will probably be made by the autumn.

**Nova Scotia and Immigration.**—Nova Scotia, and the Island of Cape Breton, in particular, has never received a "square deal" in the matter of immigration and labour supply. The overwhelming bulk of the advertising literature that issues from the Dominion and floods the countries of Europe paints the lure of the "last, best West," but who in Europe, outside a few specialists, hears of Nova Scotia? There are people even in Toronto who regard Cape Breton as a close approximation to the wilds of the Yukon, and who have a vague idea that the country and the climate resemble northern Labrador. It is only a short while ago that a letter was received in Glace Bay addressed to the "Old Dominion Coal Company, Little Glace Bay, South Cape Breton." The letter came from one of the Government Departments at Ottawa, and the address had evidently been extracted from a directory at least twenty-five years old. Why the word "old" was prefixed to the address is a mystery, unless the idea was to give the address a thoroughly antiquarian flavour. A metropolitan newspaper recently referred to Glace Bay as "a little cove on the Bay of Fundy." These incidents are trivial, but illustrate the prevailing ignorance of Nova Scotia. Most people think of Glace Bay as a place where Marconigrams are received for the New York dailies, and if they remain in ignorance of the existence of the greatest coal industry in Canada, it cannot be said that the advertising agencies of the Dominion make much ado to enlighten them.

The immigrant fare on the railway from Halifax to Montreal and Toronto is very much less than the fare from Halifax to Sydney, i.e., an immigrant is carried from Halifax to a city over a thousand miles distant for a less charge than for conveyance from Halifax to Sydney, a distance of less than three hundred miles.

The regulation which demands that every intending immigrant into Canada must show $25.00 of his own money in addition to transportation to destination, was temporarily held in abeyance, but becomes effective again at the 1st of July, because of alleged signs of financial depression. It may be that frantic speculation and foolish inflation of values in the West are being reduced to saner dimensions by the existing tightness of the world's money markets, but no financial depression exists in Nova Scotia, nor any threatened surplus of workers. Since 1906 there has been a chronic labour shortage in Nova Scotia. The Province needs immigrants, particularly miners and mine labourers. Farm labourers and railway labourers are admitted into Canada without restriction. Why should not mine labourers be considered equally necessary? Canada is not wholly dependent on farmers and railways, though to judge from some of the regulations of the Immigration Department some people apparently think so.

It is an absurdity to expect a European miner to emigrate who can raise $25.00 in addition to steamer fares and rail fares, and an outfit. This means an expenditure of from $100.00 to $150.00 for the miner who wishes to emigrate from Germany or England. The miner in Europe who can boast of such a sum has no need to emigrate, but there are hundreds of miners who cannot pay their way across who would gladly come were they able. It is not fair to judge conditions as to labour in Cape Breton by the congested areas of Western boom cities, or the winter soup kitchens of Toronto and Montreal.

Nova Scotia should demand a separate Immigration Department of her own, unhampered by Federal control. The immigration needs of the Province are pressing and peculiar, and no industry in Nova Scotia should be in the least degree hampered by regulations framed to meet conditions prevailing in the other Provinces of the Dominion, but not present in Nova Scotia. Halifax is the great gateway for immigration—to the West. The newspapers report 5,000 immigrants in one day, of which number not fifty stay east of Montreal. It is even said that immigrants brought especially to Nova Scotia through the efforts of the paid immigration officers of the Province have been detained and threatened with deportation under Federal laws administered by Federal officials. Surely it is time Nova Scotia said what immigrants should or should not come through her principal port, and insisted on equal terms with the West.

## BRITISH COLUMBIA.

### War Eagle Mine Headworks Burned.

The Rossland "Miner" has printed the following account of the destruction by fire, on June 1, of the big shafthouse and other buildings comprising the head works of the War Eagle mine at Rossland, British Columbia, which mine is one of the well-known Centre Star group of mines, owned by the Consolidated Mining and Smelting Company, of Canada, Ltd.

"One of Rossland's chief landmarks was destroyed by fire on Sunday evening, when the War eagle shafthouse, standing as it did on one of the slopes of Red Mountain, so that it could be seen from every portion of the city, went up in smoke and flames. The shafthouse contained, beside the plant, a lot of very dry mining timber, ready for use in the mine, and this also burned very rapidly.

"The fire was successfully fought from the shaft of the War Eagle. One bulkhead was put in on the 100-ft. level of the mine, and another on the 200-ft. level. The flames were prevented from entering the mine by means of well-directed streams of water from the collar of the shaft and from the 100-ft. level. Only about 25 ft. of the timbers below the collar was burned.

"After the fire had burned for nearly an hour, the structural steel frame of the building and the steel gallows-frame, collapsed as easily as though they had been of cardboard.

"The flames continued their work of destruction until about 11 o'clock at night, but in the meanwhile the streams of water were kept constantly at work until finally the fire was extinguished. The loss is estimated at about $50,000; it is partially covered by insurance.

"On Monday morning work was continued as usual in the mine, and a number of men were employed on the surface in clearing away the debris. The War Eagle hoist has been used to lower and bring up men and to handle waste and timber. The ore has been sent up through the Centre Star shaft, so the destruction of the War Eagle shafthouse will not seriously affect the production of ore nor reduce in numbers the underground working force. The Centre Star hoist can do, and is doing, the work that had been done by the War Eagle hoist, so that the disaster is not nearly so serious as would have been the case had the Centre Star headworks been destroyed instead of that of the War Eagle.

"The War Eagle shafthouse was erected in 1898-9, soon after the Gooderham-Blackstock syndicate acquired the mine."

### Placer-Mining on Granite Creek, B.C.

The Similkameen Star says: "R. A. Lambert has again replaced the dam on Granite creek, near the north fork, which was washed away by high water last year. He has made the present dam as secure as possible, having anchored it in the solid rock on either side. Its dimensions are: 80 ft. long, 10 ft. deep, 12 ft. 6 in. wide, and an apron of 30 ft. Much interest is taken in Mr. Lambert's work, which, if proven successful, will give an immense impetus to placer-mining throughout the district. Gold and platinum are known to be in the creeks and rivers and it is hoped Mr. Lambert may demonstrate the successful mining of these placers. His flume is 950 ft. long, 5 ft. 6 in. by 3 ft. inside, and will carry the creek at low water."

The following excerpt from a paper by Mr. Chas. Camsell, of the Geological Survey of Canada, taken from Vol. XIII, 1910, of the "Journal of the Canadian Mining Institute," is of interest in connection with the foregoing news:

"A short distance above the mouth of the north fork, on the main Granite creek, Messrs. R. A. Lambert and Stewart are doing the only serious placer-mining in the whole district. The preliminary development has been carried on by five men for the past three seasons, but the actual sluicing of the gravel may only commence in the coming season. Lambert and Stewart have a lease of one-and-a-half miles of the creek bed above the north fork, a very small part of which had been worked in former times. The gold recovered from these portions was very coarse, though the bedrock was reached in only one spot. In this particular portion, which was but 200 ft. in length, the yield is said to have been $1,200 to the length of a sluice box, where the gravel in the stream bed had a width of 40 to 50 ft. This yield included nuggets, the gold value of which was from $100 to $150; the platinum, however, was fine. The remainder of the creek bed covered by the lease is deep ground and could not be bottomed. Lambert and Stewart are now engaged in cutting down the bed of the stream in the lower part of their lease, in order to reach bedrock and recover the gold and platinum lying on it. Commencing at the lower end of their ground, a dam has been constructed across the stream bed, while 600 ft. of a board flume carries the water over the portion of the channel which it is proposed to first work. The large boulders and rock in the lower part were blasted away, thus enabling the removal by ground-sluicing of a depth of about 25 ft. of gravel, which before formed the bed of the stream. The depth of gravel overlying the bedrock is now about 5 ft. and the point has been reached when the gravel can be shovelled into the sluice boxes. This, however, can only be done after the season of high water has been passed. The returns should show a proportion of about four parts of gold to one of platinum, and should amply repay the cost of the preparatory work."

**Conditions in Metal Mining Camps.**—With the return of summer there is general activity in the chief metal mining camps of the Province. Although there is still an unsettled feeling in parts of Slocan district owing to the persistence of the agitating element of the Miners' Union, there has not been any stoppage of mining operations from labour troubles. Whether or not there will yet be seems uncertain, but it is understood that a considerable number of the miners are opposed to a strike. There does not appear to be a similar feeling in either Rossland or Boundary camps, or at least nothing was heard during a recent visit suggestive of any serious interference with mining operations. On the Coast, the situation at the Britannia Co.'s camp is stated to be similar to what it has been ever since the company made up its full number of miners and helpers from non-union sources.

**In the coal mining districts** matters are as usual, with the exception that the mines at and about Nanaimo, Vancouver Island, are still non-productive. Whether the operators will be able to resume production without first coming to an agreement with the United Mine Workers of America, which organization called the strike, is not yet clear; certainly they are endeavouring to make arrangements with a sufficient number of their employees to get things running again independently of the sanction of the union. At the time of writing no information is available as to the prospects for success or failure in this direction.

**Kaslo.**—On July 13 the "Spokesman-Review," of Spokane, Washington, published the following concerning the Rambler-Cariboo, one of the best-known mining properties in Slocan district: "According to a report received yesterday by Walter J. Nicholls & Co., the Rambler-Cariboo mine, in Slocan district, B.C., up to May 1, had shipped 250 tons more ore to the smeltery at Trail than the total output of the mine in 1912. The shipments for the period covered by the report aggregated 1,403 tons, as against 1,153 tons for the whole of 1912. Last week the quantity shipped amounted to 189 tons, and the company is preparing to increase operations. The new concentrator is turning out 300 tons of concentrates weekly and the output is to be augmented, according to the report, as a higher-grade mill-feed is being extracted for treatment. All kinds of rumors are being circulated locally in explanation of the sudden drop in the price of Rambler-Cariboo shares, the most persistent being that the concentrator, completed but recently, will have to be rebuilt, the system having proved inefficient, but officials of the company vigorously deny this and assert there is nothing in the financial condition of the company to warrant the break, and that there is nothing wrong with the property physically. There are between 350 and 375 shareholders in the Rambler-Cariboo Company, most of them residents in the Inland Empire, and the recent rapid decline in the price of the shares, coupled with the resignation of Mr. W. E. Zwicky, the former general manager, has caused some uneasiness among them."

**New Denver.**—Now that the snow is off the wagon-road to the Idaho-Alamo mines, the repairing gang has been putting the road in good condition for hauling. Two cars of silver-lead ore will be at once hauled to the railway at Alamo, for shipment to Trail.

**Capella Mine.**—The trail to the Capella is being cleared and supplies will shortly be taken up, so that W. R. Will may resume work in this mine. Some very rich silver ore has been taken from the Capella in past years, one carload having returned more than $10,000.

**Silverton.**—With the melting of the snow the wagon-road and trail to the L. H. group, in the mountains a few miles south of Silverton, is once more fit for travel, so the British Columbia Copper Co. is arranging to resume development work on the Slocan property, on which it has an option of purchase. There is here a body of ore of considerable size and averaging $7 or $8 in gold.

**The Consolidated Mining and Smelting Co.** has taken under option a group of claims in Four-mile camp, near where the old Wakefield concentrating mill stood before it was burned. Thos. J. Lloyd has been prospecting this group and having developed a good showing has bonded it to the Consolidated Co., which is arranging to do further development work.

**Silverton Mines, Ltd.**—The concentrating mill recently put in by the Silverton Mines, Ltd., is reported to be working satisfactorily on ore from that company's Hewitt-Lorna Doone group of mines at which development work has been kept up for a number of years. One unit of the Minerals Separation flotation process plant has been included in the equipment of the new concentrator.

**Greenwood.**—The work of hauling to the Jewel gold mill at Long Lake, some 40 or 50 tons of new machinery, which lately reached Eholt from England, was in progress late in May and early in June. C. A. Banks, manager for the Jewel-Denero Mines, Ltd., immediately set about installing this additional plant. Lumber for use in the erection of another building for the accommodation of men employed at the Jewel has also been taken up from Eholt. It is stated that operation of mine and mill will shortly be undertaken to full capacity and that there will consequently be more activity in Long Lake camp than for a number of years.

More than 3,000 tons of ore has been shipped from the Consolidated Mining and Smelting Co.'s No. 7 mine since work was resumed in it several weeks ago. The ore is quartz, containing value in gold and silver; it is conveyed by aerial tramway down to the Canadian Pacific Railway at Boundary Falls and hauled thence to the smeltery at Trail.

**Hedley.**—From the Gazette it is learned that T. Walter Beam left Hedley late in May for Denver, Colorado, intending to return in June to spend part of the summer in the camp. Before leaving he saw that arrangements for prospecting the properties he and his associates lately bonded were well forward, and diamond-drilling had been commenced. The country over which power and water lines had to be taken is rough and it was somewhat difficult to do the requisite preliminary work in the rocky canyons in which much of the drilling is to be done. It is stated that three drills will be kept in continuous operation, and some 25 men will be employed. Gomer P. Jones, general superintendent for the Hedley Gold Mining Co., will have the oversight of this work as well as continuing his ordinary duties.

**New Hazelton.**—At the Erie, on Four-mile mountain, the tunnel was in 170 ft. by the end of May. Another car of ore is to be shipped, this time to the Consolidated Co.'s smeltery at Trail. Some time since the district gold commissioner reported that a shaft had been sunk 75 ft., while open-cuts had been made in the outcrop of the vein along a distance of 300 ft. The vein had been found to have an average width of 14 ft. and to contain an ore-shoot ranging from 18 in. up to 4 ft. 6 in.

There are now about 30 men employed at the Silver Standard, on Glen mountain, and three power drills are being worked. The cross-cut adit is being advanced about 6 ft. a day and it is expected that the vein will be reached before the end of June. After the provincial mineralogist visited this property two years ago, he reported that much prospecting work had been done on a system of several veins varying in width up to 6 ft. of vein-matter, chiefly quartz. The work done had shown the veins to be continuous and permanent and to contain in places shoots of ore, principally galena. A sample taken by that official gave returns on assay: Lead, 58 per cent.; silver, 303 oz.; and gold, 0.24 oz. to the ton. Since then underground development has proved the occurrence of much ore of excellent grade, and the property has been sold to a railway contractors' syndicate—Stewart, McLeod and McHugh.

# COMPANY NOTES

## VIPOND PORCUPINE GOLD MINES COMPANY

Manager C. H. Poirier, under date of May 23rd, 1913, says in part: "The total amount of development to date is as follows: Shafts, 385 feet; drifts, 2.517 feet; crosscuts, 1,832 feet, raises, 220 feet; 1.070 feet of drifts on the various veins has been timbered, chutes placed at intervals, and stopes started.

"The installation consists of the following: One Sullivan two-stage belt-driven compressor of 873 cubic feet capacity per minute, driven by a 150 h.p. G. E. motor, one 9x12 Jenckes hoist, one 100 h.p. Robb-Munford boiler, three transformers of 225 kw. capacity, mill installation of the Hardinge type of 120 tons daily capacity, fully equipped with motors, etc., and 600 square feet of amalgamating plate. Blacksmith shop with all necessary furnishings, change house, fitted with shower baths, for the convenience of the men. Powder magazine, powder thaw house, three cottages, store house and stable. Suitable buildings housing all machinery, headframe and plant. Necessary lighting and heating equipment.

"The main shaft has been sunk to a depth of 325 feet, crosscuts have been run at 100-foot intervals, intersecting both the Godfrey and the Davidson veins, the limits of the main oreshoots on these veins have been reached on both the 100 and 200-foot levels, and both shoots have been partially explored on the 300-foot level. Surface prospecting has shown the existence of at least one additional oreshoot on the Davidson vein which has not yet been explored underground. A very small amount of drifting would prospect this oreshoot at a depth of 300 feet.

"A conservative estimate of ore blocked out above the 200-foot level shows 40,000 tons of an average assay value of $10.00 per ton. Development on the 300-foot level shows the continuance of the known oreshoots above on both the Godfrey and Davidson veins to that depth, and as far as the work has gone there is apparently no change in values or widths. The ore occurrence being erratic, the above estimate includes only ore blocks that have been exposed on at least three sides. An additional probable tonnage of at least 15,000 tons between the 200-foot and the 300-foot levels can reasonably be figured on.

"Based on the mining and milling of over 5.000 tons of ore, it is estimated that the total cost of extracting 95 per cent. of the values in the above ore reserves will average approximately $4.45 per ton. Tailings impounded from ore already treated should yield a net recovery of over $15,000.

"The gross bullion output to date has been $20,928.00, this represents a recovery of 48 per cent. of the values in the ore milled. The low extraction is accounted for by the high percentage of sulphides, found in the ore from the Davidson vein, and the difficulty in securing the necessary supply of water for amalgamation. Numerous tests have shown that the addition of a suitable cyanide plant to our present installation, will insure a recovery of at least 95 per cent.

"A cyanide plant should be erected as an annex to the present mill installation, the tailings resulting from past operations cyanided, work underground started, in time to insure a full supply of ore for the mill, when the tailings have been disposed of and development of the known ore bodies carried on at a rate commensurate with the output of the mine."

Henry H. Ward, president of the company, in a letter to shareholders states that he and his associates, in addition to paying in $125,000 for stock at 50 cents a share, have advanced since January 1st, 1912, upwards of $60.000. Other shareholders were asked to subscribe $50,000. On May 23rd, 1913, shareholders of the Porcupine Gold Mines Company were offered for subscription at par, $125.000 bonds of the Vipond Porcupine Mines Company, Limited.

President Ward, in a letter accompanying the offer of bonds, says in part:

"Pursuant to an agreement made in October, 1911, a syndicate composed for the most part of the Directors of the Company, bought and paid for 250,000 shares of the Treasury Stock of the Company at 50 cents per share, a price at that time somewhat higher than the market value. This realized the sum of $125,000 for the Company. Under the agreement entered into at the time this amount was to be paid in before January 1st, 1913. Full payment of the amount, however, was completed on June 14th, 1912. After that date further amounts, aggregating in excess of $62,000, were advanced to the Company by certain shareholders. Other indebtedness of the Company amounts to somewhat more than $18.000.00.

"At the time that the agreement was entered into by which the Company was provided with the $125,000.00 it was expected that the machinery which was to be purchased with the funds so provided would be installed and in operation certainly not later than April 1st, 1912. There was various unforeseen and unavoidable delay in connection with the installation of this machinery, and as it was not considered wise to halt development work pending its installation, the funds thus provided had to be used not only for the purchase of machinery, but to carry on development work for a considerably longer period than had been anticipated. It resulted, therefore, that when the mill was finally ready to operate, about July 1st, 1912, the $125,000.00 had been spent, and it was necessary for further money to be advanced before the mill could be put on a paying basis.

"Even then it was hoped that the operation of the mill, treating the ore by the amalgamation process alone, would pay for operating expenses, provide for a reasonable amount of development, and soon put us in a position where, if additional plant was required, it could be purchased without its being necessary to undertake any new financing of the company. However, although the mill was found to be satisfactory in every way, so far as its design and installation were concerned, it was found that the ore under conditions existing could not be treated by the amalgamation process with an extraction sufficient to carry out this program as expected. It was found, too, when the actual stoping of the mine was undertaken, that in many parts of the workings, the walls were of such a character that considerably more waste was broken with the ore than had been calculated upon. This reduced the head assays considerably, and, while the amount of ore, or ore and waste, treated was thereby somewhat increased, the expense of extracting a given amount of value increased also.

"Another difficulty encountered in the operation of the mill was the lack of sufficient water to satisfactorily treat the ore by the amalgamation process alone.

"Before determining on further steps to be taken, an examination of the property was made by competent engineers, and, as a result of their report, it was decided that it would be necessary and desirable to install a cyanide plant. The cost of this installation should not exceed $30,000.00.

"From the statements of our engineers and from examination of other similar cyanide plants in operation, it is confidently expected that with the erection of the cyanide plant our extraction will be not less than 95 per cent. Moreover, the difficulty as to the water supply will be eliminated as the available supply of water is at all times sufficient to run the mill to its full capacity using the cyanide process.

"In November, 1912, the mine operatives of the Porcupine District went on a strike, shutting down practically all of the plants in that district including our own, and in view of the conditions existing we have considered it wiser not to resume operations until the cyanide plant is provided and ready for operation. In the meantime our staff has been reduced to the lowest possible limit, and our monthly expenses cut down correspondingly.

"As will be seen from the foregoing, certain shareholders of the Company in addition to providing on terms most liberal to the company the amount of $125,000, have further advanced the considerable sum of $62,000, for the further operations and development of the property. The indebtedness of the Company to these shareholders and other creditors now amounts to $80,000+. The Directors have used their best efforts not only to carry the work on economically, but to provide or obtain the necessary funds, without calling on the general body of shareholders. Under present circumstances, and in view of the large amounts already advanced, and in view of the other debts of the Company, it becomes necessary in the interests of all shareholders to provide for an early liquidation of these debts and provide at the same time sufficient additional funds to erect further plant and put the property on a paying basis. In the event that a sufficiently large amount of subscriptions are not received it will obviously be necessary for the present creditors to take such steps as may be necessary for the protection of their own interests. Should this course be forced upon them the interests of the shareholders at large may suffer. It is, therefore, in the best interests of all concerned that shareholders respond generally and liberally to this call."

## SIR W. G. ARMSTRONG WHITWORTH AND CO., LIMITED.

The certified profits for the past three years, after providing for Depreciation, Interest on the Debenture Stock and the Dividend on the four per cent. Preference Shares, have been as follows:

For the year ended—

| | |
|---|---|
| December 31st, 1910 | £487,864 18 0 |
| December 31st, 1911 | 467,826 3 7 |
| December 31st, 1912 | 635,526 11 6 |

Dividends have been paid on the ordinary shares for the past five years as follows: 1908 to 1910, 10 per cent.; 1911 and 1912, 12½ per cent. In the year 1912, after providing for the interest on the Debenture Stock the dividend on the four per cent. Preference Shares and the above-mentioned dividend for 1912 of 12½ per cent., there was carried forward to the credit of Profit and Loss Account the sum of £335,849 10s.

The company's works at Newcastle, Manchester and elsewhere are fully occupied, and orders are in hand which the directors consider sufficient to justify them in estimating that the rate of profit above indicated will be maintained.

The Directors of the Company are: Sir Andrew Noble, Bart., K.C.B., F.R.S., Chairman; The Right Hon. Lord Rendel, Vice-Chairman; Herbert Hanbury Smith Carington, Esq.; John Meade Falkner, Esq.; Colonel Sir Edouard Percy Cranwill Girouard, K.C.M.G.; Henry Neville Gladstone, Esq.; The Right Hon. Sir George Herbert Murray, G.C.B.; John Henry Brunel Noble, Esq.; Saxton William Armstrong Noble, Esq.; Rear-Admiral Sir Charles Langdale Ottley, K.C.M.G.; Henry Whitehead, Esq., M.V.O.

**Rambler-Cariboo Mines.**—Early in June directors and shareholders in the Rambler-Cariboo Mines, Ltd., from several cities in the State of Washington proceeded to Kaslo, B.C., to there attend the annual meeting of the company, convened for Tuesday, June 10th. Before the meeting was held a visit was paid to the Rambler-Cariboo mine, in McGuigan Basin, Slocan, and the concentrating mill on the middle fork of Carpenter Creek, about three miles above Three Forks. The party included Dr. John Armstrong, Tacoma; Mr. Frank Bowman, Seattle; Dr. B. W. McPhee, Col. John Hunter and Mr. Alfred Coolidge, of Spokane. At the meeting, Messrs. Coolidge and A. M. McLaine, and Dr. McPhee, all of Spokane; Dr. Armstrong and Rev. Father S. P. Hylebos, of Tacoma; and Dr. John Benson, of Colfax, were re-elected directors of the company. Mr. W. E. Zwicky, of Kaslo, for many years manager of the company, tendered his resignation. Mr. John Rinta, also with the company a long while, as mine superintendent, is named as likely to succeed Mr. Zwicky as manager.

# STATISTICS AND RETURNS

## BRITISH COLUMBIA ORE SHIPMENTS.

For week ending June 14, and for this year to date, ore production and smelter receipts, in tons, are:

**Boundary.**

| | Week. | Year. |
|---|---|---|
| Nickel Plate, milled | 1,500 | 36,000 |
| Granby | 21,991 | 563,379 |
| Motherlode | 4,830 | 151,462 |
| Rawhide | 5,298 | 119,653 |
| Napoleon | 245 | 16,203 |
| Unnamed | 198 | 3,268 |
| Knob Hill | 79 | 1,251 |
| Ben Hur | 445 | 5,540 |
| United Copper | 204 | 2,234 |
| No. 7 | 337 | 3,490 |
| Hope | 56 | 250 |
| Other mines | ... | 3,430 |
| Total | 35,183 | 906,160 |

**Slocan and Ainsworth.**

| | | |
|---|---|---|
| Standard, milled | 500 | 12,000 |
| Van Roi, milled | 725 | 15,608 |
| Rambler-Cariboo, milled | 300 | 7,200 |
| Bluebell, milled | 1,200 | 28,600 |
| Richmond-Eureka | 35 | 355 |
| Standard | 263 | 6,788 |
| Bluebell | 208 | 3,711 |
| Eastmount | 33 | 150 |
| Rambler-Cariboo | 106 | 1,509 |
| No. 1 | 168 | 1,598 |
| Other mines | ... | 3,068 |
| Total | 3,538 | 80,587 |

**Lardeau.**

| | | |
|---|---|---|
| Other mines | ... | 233 |

**Nelson.**

| | | |
|---|---|---|
| Motherlode, milled | 500 | 12,000 |
| Queen, milled | 350 | 5,775 |
| Second Relief, milled | 200 | 4,200 |
| Queen Victoria | 407 | 12,084 |
| Other mines | ... | 8,357 |
| Total | 1,457 | 42,416 |

**East Kootenay.**

| | | |
|---|---|---|
| Sullivan | 344 | 16,826 |
| Other mines | ... | 757 |
| Total | 344 | 17,583 |

**Rossland.**

| | | |
|---|---|---|
| Le Roi No. 2, milled | 350 | 8,400 |
| Inland Empire, milled | 275 | 825 |
| Centre Star | 2,787 | 65,845 |
| Le Roi | 386 | 27,024 |
| Le Roi No. 2 | 89 | 9,615 |
| Other mines | ..... | 199 |
| Total | 3,887 | 111,908 |

**Granby Smelter Receipts.**

Grand Forks, B.C.

| | | |
|---|---|---|
| Granby | 21,991 | 563,379 |

**B. C. Copper Co.'s Receipts.**

Greenwood, B.C.

| | | |
|---|---|---|
| Motherlode | 4,830 | 151,462 |
| Rawhide | 5,298 | 119,653 |
| Napoleon | 245 | 16,203 |
| Queen Victoria | 407 | 12,084 |
| Unnamed | 198 | 3,268 |
| Total | 10,978 | 302,670 |

**Consolidated Co.'s Receipts.**

Trail, B.C.

| | | |
|---|---|---|
| Knob Hill | 79 | 1,251 |
| Ben Hur | 445 | 5,540 |
| United Copper | 204 | 2,234 |
| No. 7 | 337 | 3,490 |
| Hope | 56 | 250 |
| Richmond-Eureka | 35 | 355 |
| Standard | 263 | 6,788 |
| Bluebell | 208 | 3,711 |
| Eastmount | 33 | 150 |
| Rambler-Cariboo | 106 | 1,509 |
| No 1 | 168 | 1,598 |
| Sullivan | 344 | 16,826 |
| Centre Star | 2,787 | 65,845 |
| Le Roi | 386 | 27,024 |
| Le Roi No. 2 | 89 | 9,615 |
| Other mines | .. | 11,307 |
| Total | 5,540 | 157,493 |

## COBALT ORE SHIPMENTS.

June 21, 1913.

The ore shipments for the week are:

| Mine. | High. | Low. | Pounds. |
|---|---|---|---|
| Cobalt Townsite | 1 | | 50,180 |
| Crown Reserve | 1 | | 40,000 |
| McKinley-Darragh | 2 | | 126,072 |
| Nipissing | | 2 | 129,824 |
| La Rose | | 1 | 100,000 |
| Cobalt Lake | 1 | | 63,100 |
| Hudson Bay | 1 | | 64,582 |
| Temiskaming | 1 | | 62,421 |
| | 7 | 3 | 636,129 |

The shipments from the Cobalt mines to date are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Coniagas | 25 | | 832.41 |
| Trethewey | 6 | 6 | 332.43 |
| Nipissing | 2 | 33 | 1,094.94 |
| Dominion Red. | 10 | | 318.66 |
| Hudson Bay | 9 | | 336.46 |
| Cobalt Townsite | 30 | | 1,073.56 |
| McKinley-Darragh | 35 | | 1,213.21 |
| Kerr Lake | 9 | 1 | 355.89 |
| Beaver | 7 | | 194.41 |
| La Rose | 31 | 2 | 1,349.27 |
| Peterson Lake (Seneca-Sup.) | 4 | 3 | 250,76 |
| Temiskaming | 10 | 1 | 340.38 |
| Crown Reserve | 7 | | 289.95 |
| Chambers-Ferland | 1 | 4 | 159.20 |
| Colonial | 1 | | 21.56 |
| Cobalt Lake | 13 | | 453.99 |
| Penn-Canadian | 3 | | 87.22 |
| Drummond | 3 | | 87.22 |
| General Mines | | 1 | 8.89 |
| O'Brien | 6 | | 221.26 |
| Silver Queen | | 1 | 60.34 |
| Bailey | 4 | 1 | 102.44 |
| Casey Cobalt | 3 | | 109.72 |
| Right of Way | 1 | 1 | 62.19 |
| City of Cobalt | 4 | | 147.20 |
| Silver Bar | | 1 | 20.00 |
| York-Ontario | 1 | | 20.00 |
| Buffalo | 2 | | 66.13 |
| Silver Cliff | 1 | | 20.00 |
| | 236 | 55 | 9,852.38 |

The bullion shipments for the week ending June 21 are:

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 109 | 123,279 | $72,734.61 |
| Kerr Lake | 3 | 3,393 | 2,001.87 |
| Dominion Red. | 43 | 48,633 | 28,693.47 |
| | 155 | 175,305 | $103,429.95 |

Bullion shipments to date, June 21, are:

| Mine. | Ounces. | Value. |
|---|---|---|
| Nipissing | 2,614,638.09 | $1,499,496.73 |
| Penn.-Canadian | 4,363.60 | 2,700.00 |
| Buffalo | 714,216.90 | 459,478.68 |
| Crown Reserve | 190,991.00 | 121,495.25 |
| Dominion Red. | 254,917.40 | 146,104.02 |
| Townsite | 10,909.00 | 6,647.00 |
| Miscellaneous | 3,920.00 | 1,623.00 |
| Temiskaming | 9,469.20 | 5,443.72 |
| O'Brien | 66,201.77 | 32,713.95 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 1,734.20 | 970.15 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 9,176.00 | 5,725.40 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 14,279.98 | 9,047.98 |
| Bailey | 1,839.00 | 1,103.40 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| | 6,428,587.39 | $4,854,059.58 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

June 23rd, 1913.

### New York Curb.

| | Bid | Ask |
|---|---|---|
| British Copper | 2.00 | 2.25 |
| Braden Copper | 6.00 | 6.25 |
| Chino Copper | 33.00 | 33.12½ |
| Giroux Copper | 1.50 | 1.56¼ |
| Goldfield Cons. | 1.75 | 1.81¼ |
| Greene Can. | 5.87½ | 6.00 |
| Inspiration Copper | 14.50 | 14.87½ |
| Miami Copper | 20.25 | 21.00 |
| Ray Cons. Copper | 16.25 | 16.50 |
| Standard Oil of N. J. | 340.00 | 350.00 |
| Standard Oil of N. Y. | 139.00 | 141.00 |
| Standard Oil Old Stock | 1020.00 | ...... |
| Standard Oil Subs | 700.00 | ...... |
| Tonopah Mining | 4.18¾ | 4.25 |
| Tonopah Belmont | 6.12½ | 6.37½ |
| Yukon Gold | 2.25 | 2.37½ |
| Nevada Cons. Cop. | 16.25 | 16.75 |

### Cobalt Stocks.

| | Bid | Ask |
|---|---|---|
| Bailey | .08 | .08¼ |
| Beaver | .32 | .34 |
| Canadian | .21 | .23 |
| Chambers-Ferland | .20½ | .21½ |
| City of Cobalt | .50 | .52 |
| Cobalt Lake | .66 | .69 |
| Coniagas | 7.00 | 8.00 |
| Crown Reserve | 3.47 | 3.55 |
| Foster | .05 | .08 |
| Gifford | .05 | .06 |
| Gould | .03 | .03½ |
| Great Northern | .16 | .17 |
| Hargraves | .03 | .03½ |
| Hudson Bay | 65.00 | 68.00 |
| Kerr Lake | 3.15 | 3.30 |
| La Rose | 2.35 | 2.50 |
| McKinley | 1.65 | 1.75 |
| Nipissing | 8.75 | 9.00 |
| Peterson Lake | .22¾ | .23¼ |
| Right of Way | .05 | .06 |
| Rochester | .03 | .03¼ |
| Leaf | .02⅞ | .03 |
| Cochrane | 1.30 | 1.40 |
| Silver Queen | .04 | .06 |
| Temiskaming | .33 | .35 |
| Trethewey | .33 | .36 |
| Wettlaufer | .11 | .13 |
| Seneca Superior | 1.90 | 2.20 |

### Porcupine Stocks.

| | Bid | Ask |
|---|---|---|
| Apex | .01 | .02 |
| Crown Chartered | .00½ | .00¾ |
| Dome Extension | .09 | .09¼ |
| Dome Lake | 1.05 | 1.25 |
| Dome Mines | 12.50 | 15.00 |
| Eldorado | ..... | ..... |
| Foley O'Brien | .26 | .26½ |
| Hollinger | 15.75 | 16.25 |
| Jupiter | .35 | .38 |
| McIntyre | 2.20 | 2.40 |
| Moneta | .04 | .06 |
| North Dome | .40 | .50 |
| Northern Exploration | 1.00 | 2.00 |
| Pearl Lake | .31 | .33 |
| Plenaurum | .95 | 1.00 |
| Porcupine Gold | .11 | .12 |
| Imperial | .02½ | .03½ |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .02½ | .03½ |
| Rea | .15 | .30 |
| Standard | .00½ | .01 |
| Swastika | .05½ | .06 |
| United | .01 | .01½ |
| West Dome | .15 | .25 |

### Sundry.

| | Bid | Ask |
|---|---|---|
| American Marconi | 4.00 | 4.25 |
| Canadian Marconi | 2.00 | 3.00 |

## TORONTO MARKETS.

June 24—(Quotations from Canada Metal Co., Toronto).

Spelter, 6¼ cents per pound.
Lead, 5½ cents per pound.
Tin, 48 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 15½ cents per pound.
Electrolytic, 15½ cents per pound.
Ingot brass, 11 to 15 cents per pound.

June 24—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.00 to $20.50 (f.o.b. Toronto).
Midland No. 2, $20.00 to $20.50 (f.o.b. Toronto).

June 24—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, $7.50 per ton.
Coal, bituminous, $5.00 per ton for 1¼-inch lump.

## GENERAL MARKETS.

### Coke.

June 20—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $2.10 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.

June 20—Tin, straits, 43.60 cents.

Copper, Prime Lake, 14.87½ cents.
Electrolytic copper, 14.62½ cents.
Copper wire, 16.00 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.15 to 5.20 cents.
Sheet zinc (f.o.b. smelter), 7.25 cents.
Antimony, Cookson's, 8.55 to 8.65 cents.
Aluminium, 24.00 to 25.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $30.00 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| June 5 | 59⅛ | 27⅝ |
| " 6 | 59⅜ | 27$\frac{11}{16}$ |
| " 7 | 59⅝ | 27½ |
| " 9 | 59¾ | 27$\frac{9}{16}$ |
| " 10 | 59¾ | 27½ |
| " 11 | 59½ | 27$\frac{7}{16}$ |
| " 12 | 59¼ | 27⅝ |
| " 13 | 59⅛ | 27¼ |
| " 14 | 59⅛ | 27¼ |
| " 16 | 59¼ | 27$\frac{5}{16}$ |
| " 17 | 59⅛ | 27¼ |
| " 18 | 58⅝ | 27 |
| " 19 | 58⅜ | 26⅞ |
| " 20 | 58⅛ | 26$\frac{13}{16}$ |

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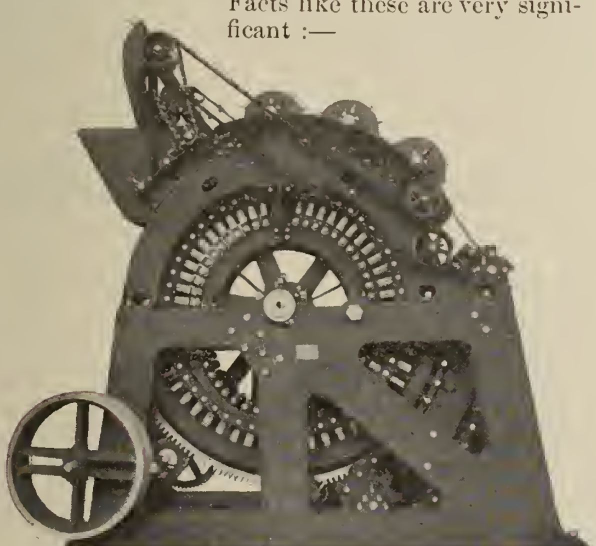

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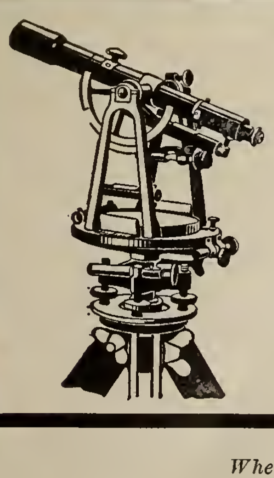

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

QUEBEC

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

ONTARIO

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

BRITISH COLUMBIA

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON AND NORTH WEST TERRITORIES

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

CANADA

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

QUEBEC

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

1202. Map 52A. Northeast part of the Serpentine Belt, Eastern Townships, Quebec. Geology. Scale 4 miles to 1 inch.

ONTARIO

750. Grenville Sheet. Parts of Counties of Ottawa, Argenteuil, Terrebonne, Two Mountains and Vaudreuil, Quebec and Carleton, Russell, Prescott and Glengarry, Ontario. Geology. Scale 4 miles to 1 inch. Reprint.

1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

1260-1276. Maps 74A-90A. Geology of the Forty ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.

1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch.

1247. Map 69A. Route map of part of Nass River, British Columbia. Scale 8 miles to 1 inch.

1168. Map 30A. Mother Lode and Sunset mines. Geology and Topography. Scale 400 feet to 1 inch; contour interval 20 feet.

1200. Map 50A. Part of Portland Canal Mining Area. Topography. Scale 2 miles to 1 inch; contour interval 200 feet.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

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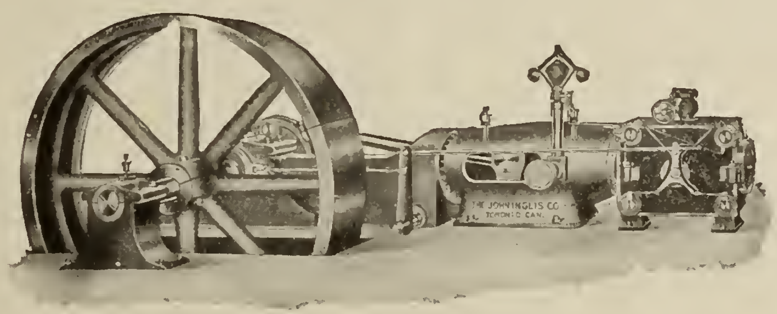

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# ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

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Canadian Ingersoll-Rand Co., Ltd.
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Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
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Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
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Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
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Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Roessler & Hasslacher.
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Thomas & William Smith.
Peacock Brothers.
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Northern Canada Supply Co.
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Northern Canada Supply Co.
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Mussens, Limited.
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Mussens, Limited.
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Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.
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Peacock Bros.
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Krupp, Fried. A. G., Germany.
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Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
The John Inglis Co., Ltd.
**Engines—Gas and Gasoline—**
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Fraser & Chalmers, Ltd.
Mussens, Limited.
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Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis Co., Ltd.
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Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
**Engines—Marine—**
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Jenckes Machine Co.
Peacock Bros.
The John Inglis Co., Ltd.
**Engines—Oil—**
Jenckes Machine Co.
Peacock Bros.
**Engines—Steam—**
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E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
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M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.
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Jenckes Machine Co.
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Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.
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Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
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Krupp, Fried. A. G., Germany.
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Mussens, Limited.
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Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
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Mussens, Limited.
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Canadian Westinghouse.
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Mussens, Limited.
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S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jeckes Machine Co., Ltd.
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Northern Canada Supply Co.
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Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
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Waterous Engine Works.
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.
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Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
**Jigs—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Jenckes Machine Co.
**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.
**Lamps—Safety—**
Canadian Explosives.
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Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.
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Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.
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Canadian Westinghouse.
**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
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Mussens, Limited.
Canadian Westinghouse.
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Canada Metal Co.
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Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.
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Can. Bag Co.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
Northern Canada Supply Co.
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Orford Copper Co.
Canada Metal Co.
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Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
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Peacock Bros.
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Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.
**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.
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Krupp, Fried. A. G., Germany.
Mussens, Limited.
E. Leonard & Sons.
**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
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Smart-Turner Machine Co.
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Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.
**Pumps—Boiler Feed—**
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Mussens, Limited.
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Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
**Pumps—Centrifugal—**
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Canadian Fairbanks-Morse Co
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
**Pumps—Electric—**
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E. Leonard & Sons.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
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E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.
**Pumps—Rotary—**
Canadian Fairbanks-Morse Co
E. Leonard & Sons.
**Pumps—Sinking—**
Canadian Fairbanks-Morse Co
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.
**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.
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Mussens, Limited.
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Smart-Turner Machine Co.
Canadian Allis-Chalmers, Ltd
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
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Smart-Turner Machine Co.
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Krupp, Fried. A. G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
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Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.
**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd
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Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.
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Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Peacock Bros.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos & Wm. Smith, Ltd.
**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.
**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Heys & Sons.
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Can. Fairbanks-Morse Co.
Peacock Bros.
Northern Canada Supply Co.
Thos. & Wm. Smith.
**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Canadian Allis-Chalmers, Ltd
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.
**Separators—**
E. Leonard & Sons.
Canadian Allis-Chalmers, Ltd
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.
**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.
**Shovels—Steam—**
Mussens, Limited.
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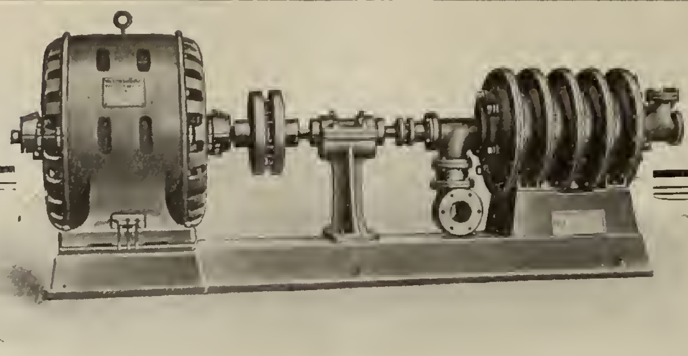

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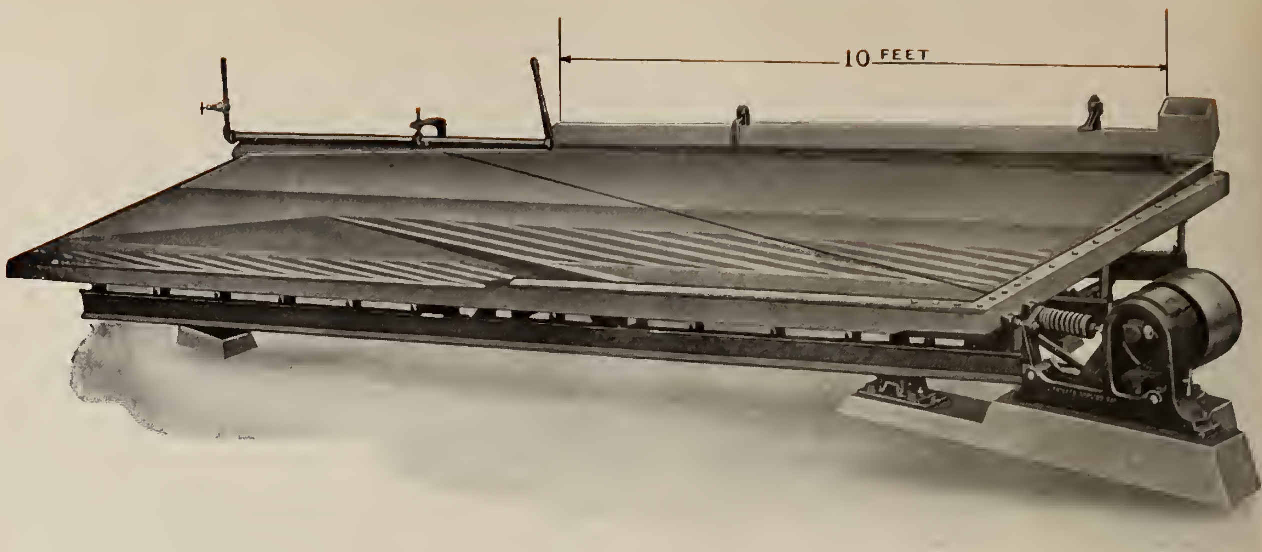


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VOL. XXXIV TORONTO No. 14



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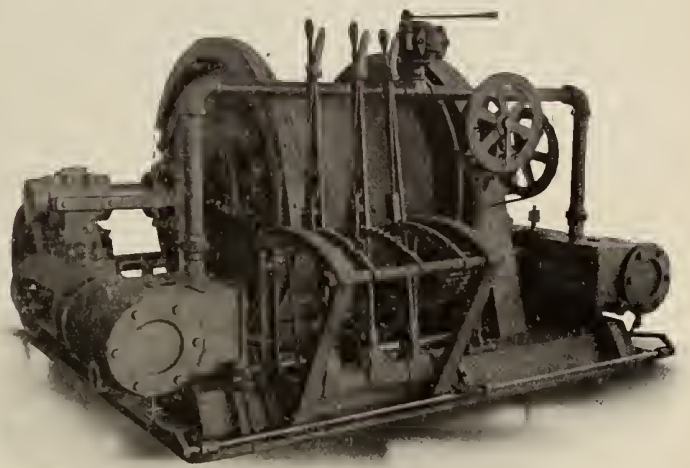

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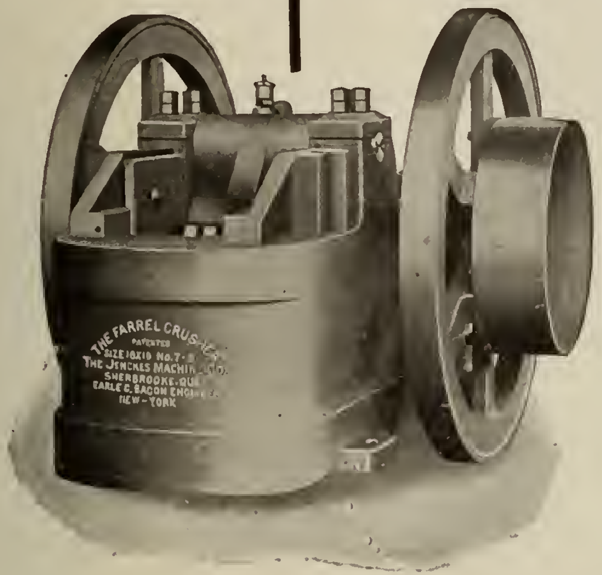

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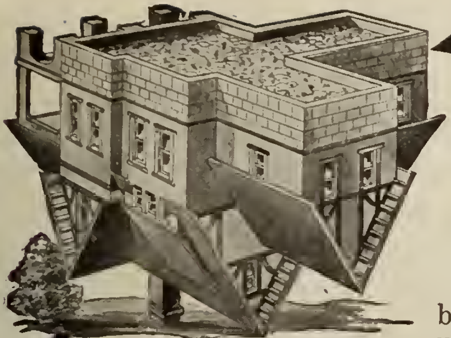

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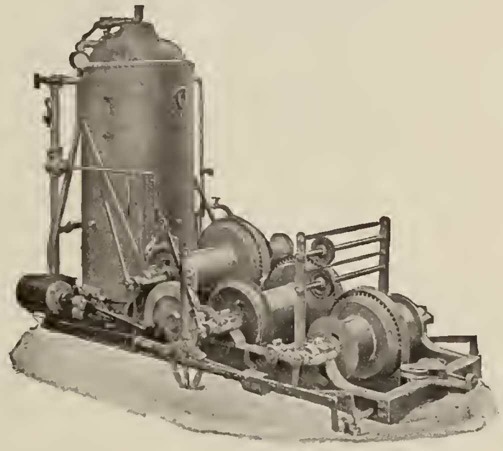

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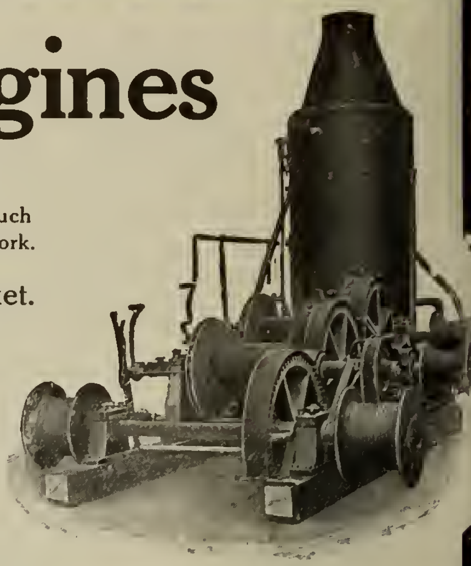

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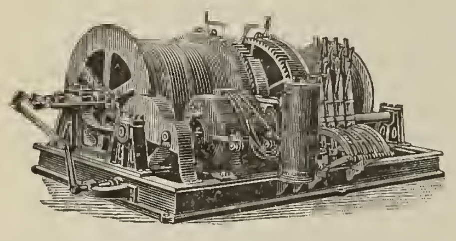

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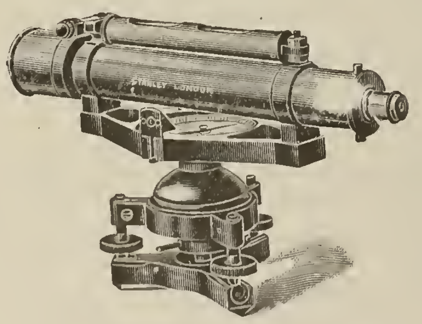

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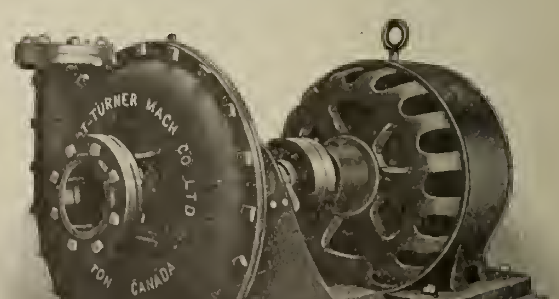

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An accurate detailed description of the equipment and practice at all of the important cyanide plants in the Republic of Mexico is given in this book. It is in part a translation of the author's book in Spanish—'Beneficio de Metales de Plata y Oro por Cianuracion.' There has been a revision as well as a translation of the material appearing in that book, so that the practice described is the latest. It contains more information on the cyanidation of silver ores than any other book. The illustrations have been carefully selected and include the flow sheets of many representative mills.

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**CANADIAN MINING JOURNAL, TORONTO**

**2nd Storey, 44-46 Lombard St., Toronto**

# THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, July 15, 1913. No. 14

## The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

*Head Office* - - 2nd Floor, 44 and 46 Lombard St., Toronto
*Branch Office* - - - - - - - 34B Board of Trade Building
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*Editor*
REGINALD E. HORE

SUBSCRIPTIONS—Payable in advance, $2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, $3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879.'

CONTENTS.



## GOVERNMENT ROADS IN ONTARIO MINING DISTRICTS

Those who have opened up mining properties in Northern Ontario have as a rule little cause to be pleased with the roads built by the government. Very poor roads have been built and these generally after much delay. It is therefore of much interest to note that the government is now building good roads and building them quickly. In the Porcupine and Gowganda districts the prospectors are by no means satisfied with the treatment they have received. In the Kirkland Lake district, however, there is more cause to commend than to criticize the government's road builders. Under the direction of Mr. J. F. Whitson, a roadway was cut from Swastika to Kirkland Lake a distance of six and a half miles, in three weeks, and grading is now being rapidly and well done. If the present rate of progress is kept up there will soon be a good road on which it will be possible to transport heavy machinery. It is planned to dress and roll the road next summer and thus make a permanent highway that will be useful at all seasons of the year.

It is to be hoped that the work now being done on the Kirkland Lake road can be taken as an indication that better treatment is to be accorded the men who are opening up New Ontario.

## GEOLOGICAL MAP OF GOWGANDA MINING DIVISION

The Geological Survey has just published what promises to be a very useful map covering twenty-eight townships in the vicinity of Gowganda, Nipissing district. Mr. W. H. Collins worked in this area during 1908-1910, and the information gathered by him has thus been made accessible. The maps made by Mr. A. G. Burrows for the Ontario Bureau of Mines, have also been an important source of information. The map is colored to show subdivisions of the Keewatin as well as of the Huronian. The succession is given as Keewatin, Huronian, Keweenawan and Pleistocene. Masses of granitic and gneissic rocks are called Laurentian Rhyolite and rhyolite tuff is colored separately and placed in the legend, below the Huronian.

The map includes the district from Shining-tree Lake on the west, to Elk Lake on the east. Gowganda, Hangingstone, Everett, Duncan, Bloom and Stony lakes and the connecting canoe routes travelled by many prospectors in the Gowganda rush, are in the area mapped.

## GEOLOGICAL GUIDE BOOKS

For use of those attending the Geological Congress in Canada this year, the Geological Survey has prepared a very remarkable set of guide books. All the producing mining districts and areas presenting interesting structural features are described and mapped. The country along the whole length of the transcontinental railroads is described briefly, and illustrated by maps that illustrate the noteworthy features, without being encumbered with a maze of unimportant detail. The guide books contain 140 such maps, and will for years be a valuable source of information. The maps of the whole country have been brought up to date and published in attractive and convenient form.

The undertaking was a gigantic one; but it has been very successfully accomplished. Director R. W. Brock and the whole staff of the Geological Survey have made a splendid success of the work, and the Government printer has shown that Canada has facilities for turning out such work in a remarkably short time. To publish such a large number of maps and accompanying text without taking several years for the work was only a few years ago considered quite impossible. It is therefore very creditable to find that Canada has prepared for our European visitors the best set of guide books yet issued by any country.

The Congress will supply guide books to all those who take part in the excursions. Complete sets will be furnished at a very nominal price.

To non-members the price for the set will be about $7.50.

## COAL RESOURCES OF THE WORLD

The volumes on Coal Resources being printed by Morang and Co. for the Geological Congress, like the guide books, are very creditable to Canada. The maps are unusually good, and the general make-up of the volume is a source of pride to both editor and publisher. The Journal will publish a review of the work after the Toronto meeting.

## THE LOGAN MEMORIAL

Mining men and geologists in Canada owe much to the work of Sir Wm. Logan, first Provincial Geologist of Canada. On a very small grant Mr. Logan in 1843 began the work of the Canadian Geological Survey. His early investigations of the Pre-Cambrian in Ontario and Quebec resulted in the first systematic subdivision of these ancient formations, in which nearly all the metallic wealth of the provinces occurs.

An arrangement is now being made to erect suitable memorials to Canada's pioneer geologist. A subscription list has been started, and you are cordially invited to subscribe. Subscriptions should be made payable to the Secretary, 12th International Geological Congress, Ottawa.

## KEELEY MINE HAS GOOD ORE

As a result of development work undertaken by Messrs. Ehrlich and associates, two good veins of ore have been discovered at the Keeley mine, which of late has received much notoriety. The credit for the discovery is due to Dr. J. McIntosh Bell, the company's agent, and former director of the Geological Survey of New Zealand. After a careful study of the mine, on which an option was taken only a few months ago, Dr. Bell planned the operations which have resulted so satisfactorily. It is stated that there is already enough ore blocked out to assure the company a very quick return of the money invested.

## SEVENTH ANNUAL REPORT OF THE BUFFALO MINES LIMITED

The annual report for the year ending April 30th, 1913, shows that the company was very successful. The recovery of silver was 710,591 ounces greater, and the net receipts were $440,038.80 larger. The recovery by the cyanide plant was much greater. The new amalgamation and refining plant was successfully operated, and enabled the company to market the silver more quickly. The ore reserves developed during the year were slightly less than the ore extracted.

The income from operations totalled $1,252,432. The expenses of operation amounted to $310,279.80, and expenses of administration $57,391.55. The net income was $891,192.99. There was paid in dividends $650,000, and surplus for the year was $233,450.49, making the total surplus April 30, 1913, $623,028.16.

The report by Superintendent Tom R. Jones says, under the heading of "Ore Reserves":

"There is no decrease in the stock piles on surface and a slight decrease in the amount of milling ore broken in the mine of 3,224 tons, making a total of 25,767 tons of ore broken in the stopes ready for milling, the mining charges of which have already been paid and no credit is taken for this work in the costs submitted.

"There is still on surface an accumulation of untreated slime tails from the previous year, for further treatment, approximately 12,000 ounces.

"The ore reserves developed were approximately 57,330 tons of about 30-ounce ore, or 1,719,900 ounces. This is about equal to the tonnage removed during the year, but slightly less in ounces. The development has been mainly along branch veins on third level No. 5, with the additional ore developed in the Nancy-Helen workings, also on the first level No. 7. This is new development, as no work has been done previously on this vein. There are several branches of this series of veins and during the coming year they should develop into considerable tonnage of milling ore."

# INTERNATIONAL GEOLOGICAL CONGRESS

During the three years since the last meeting of the Congress, the officers have been preparing for this meeting in Canada. The Dominion and Provincial Governments have contributed liberally, and the railroads have made very low rates for members attending. During the past year a very large number of Government geologists have been working on maps and descriptions of the centres to be visited. The mining companies have given much assistance and will offer the members unusual opportunities of seeing the properties.

Among those who will visit us this summer will be many of the most prominent geologists in the world. It means much that these men by their visit will obtain some idea of the wonderful possibilities of Canada as a mineral producing country.

The first excursion, A1 in charge of Dr. G. A. Young, leaves Montreal July 13. A visit will be made to Quebec and vicinity on July 14, and the following day will be spent on the south shore of the St. Lawrence. Then two days will be spent studying the formation at the eastern extremity of Gaspe Peninsula. On July 19, iron deposits of Bathurst, New Brunswick, will be examined. On July 20 the party will be in Halifax. Visits will be made to the gold and coal mines and the industrial plants at Sydney, Antigonish, Joggins, Moncton, and St. John will be starting points for several local excursions to study geological structures. The party will return to Ottawa Friday, August 1st.

On July 24 Dr. F. D. Adams and Dr. A. E. Barlow lead a party to points of interest in the Haliburton-Bancroft area, Eastern Ontario. The area lies to the north of Lake Ontario, on the margin of the Laurentian Protaxis of the continent. In this district is exposed the most notable section of the Grenville Series in Canada. The strata show to a remarkable degree the results of progressive metamorphism, as a consequence of the intrusion of extensive batholiths of granite, producing various types of amphibolite, etc. This district is also interesting by reason of the very extensive development of nepheline and other alkaline syenites, some of which are of the rarer types. In certain localities these rocks contain an abundance of corundum, while elsewhere sodalite, of a fine depth of colour, is conspicuous. The excursion will also include an inspection of the corundum mines and mills at Craigmont. This party will visit Craigmont on July 30 and arrive in Ottawa July 31.

The guides for the first excursion of members of the Congress to Sudbury, Porcupine and Cobalt will be: Dr. W. G. Miller, C. W. Knight and A. G. Burrows, of the Ontario Bureau of Mines; Professors A. P. Coleman and T. L. Walker, of the University of Toronto; Mr. J. B. Tyrrell, consulting mining engineer, Toronto; and Mr. Arthur A. Cole, mining engineer of the T. and N. O. Ry. Commission, Cobalt.

Dr. W. G. Miller, Provincial Geologist, who is leader on this trip, has arranged to open quarters at his office in the Parliament Buildings for the convenience of the excursionists. The start will be made from Toronto Wednesday evening, July 23, and from Montreal Wednesday morning.

Among those who will make the trip are: J. Stansfield, McGill University; A. W. G. Wilson and G. C. Mackenzie, Mines Branch, Dept. Mines, Ottawa; Alfred C. Lane, Tufts College, Mass.; J. Barrell, Yale University, New Haven; F. L. Ransome, U. S. Geological Survey, Washington, D.C.; H. Eckfeldt, South Bethlehem, Penn.; Miss C. A. Raisin, Bedford College, London, Eng.; A. E. Kitson, London, Eng., delegate of University of Glasgow; S. W. Beyer, Iowa State College, Iowa; H. F. Bain, Editor Mining and Scientific Press, San Francisco, Cal.; G. A. J. Cole, Director Geological Survey of Ireland, Royal College of Science, Dublin, Ireland; Bedford McNeill, president Inst. of Mining and Metallurgy, London, Eng.; Mrs. Bedford McNeill; Dr. Jules Szadeszky de Szadecsne, Kolozsvar, Hungary; Guiseppe Mercial, Pisa, Italy; Fred Searls, Jr., Goldfield, Nevada; Eugenisz Romer, Lemberg, Austria; William H. Emmons, professor of Geology, University of Minnesota, Minneapolis, Minn.; Serafino Cerruli-Irelli, Rome, Italy; Ettore Matirolo, Ingeniur en Chef des Mines, Torino, Italy; George W. Graham, Government Geologist, Khartoum, Anglo-Egyptian Soudan; Annie Eubank, Toronto; Arthur G. Charleton, London, Eng.; Reginald E. Hore, Canadian Mining Journal; H. Sjogren, Sweden; Charles McDermid, Secretary Institute of Mining and Metallurgy, London, Eng.; Prof. E. Wherry, Lehigh University, South Bethlehem, Pa.; E. Ordonez, mining geologist, Mexico City, and Mrs. Ordonez.

## LOGAN MEMORIAL.

At the meeting of the Organization Committee of the Twelfth International Geological Congress, held at the Chateau Laurier, Ottawa, on Tuesday, March 4th, 1913, it was moved by Mr. W. Fleet Robertson and seconded by Mr. W. F. Ferrier and carried:

"That the Logan Memorial Committee, consisting of Messrs. Barlow, Brock, Coleman and Miller, be instructed to proceed with the arrangements for the erection of suitable memorials to the late Sir William Logan, the locations and characters of the memorials to be left to the named committee and that the Organization Committee guarantee the expenses up to the sun of Five Hundred Dollars."

In agreement with this motion the Logan Memorial Committee have asked Mr. Henri Hebert to design and execute a bronze tablet measuring 25 by 30 inches, with a suitable inscription and a bust of Sir William Logan in relief. The original of this tablet will be placed in a suitable and conspicuous place near the entrance of the Victoria Memorial Museum at Ottawa. A duplicate will be securely fastened in position on the southern face of a conspicuous exposure of limestone breccia near the village of Perce, (Gaspe Peninsula), Quebec.

Subscriptions may be handed to any of the members of the Logan Memorial Committee or sent direct to the Secretary of the Twelfth International Geological Congress, Victoria Memorial Museum, Ottawa.

You are cordially invited to subscribe.

The following is a list of the subscribers to the Logan Memorial to date: J. A. Bancroft, \$10; A. E. Barlow, \$25; R. W. Brock, \$5; C. Camsell, \$5; C. H. Clapp, 5; J. M. Clarke, \$50; D. B. Dowling, \$5; J. A. Dresser, \$20; C. Drysdale, \$5; D. A. Dunlap, \$20; W. F. Ferrier, \$20; Abbe R. Guimont, \$5; E. Haanel, \$5; R. Harvie, \$5; R. E. Hore, \$5; M. L. Hersey, \$10; E. Jenkins, \$5; W. A. Johnson, \$10; E. D. Kindle, \$2; O. E. LeRoy, \$5; G. G. S. Lindsay, \$5; A. P. Low, \$10; Jas. McArthur, \$10; W. McInnes, \$10; D. S. McIntosh, \$5; J. McLeish, \$5; G. F. Matthew, \$5; W. H. Merrill, \$5; Mussens Ltd., \$10; M. Nordegg, \$10; W. A. Parks, \$5; M. E. Purcell, \$1; T. W. Racey, \$5; J. C. Sutherland, \$2; J. B. Tyrrell, \$10; T. G. Wait, \$2; J. White, \$5; A. B. Willmott, \$5; A. G. Wilson, \$5; M. E. Wilson, \$10.

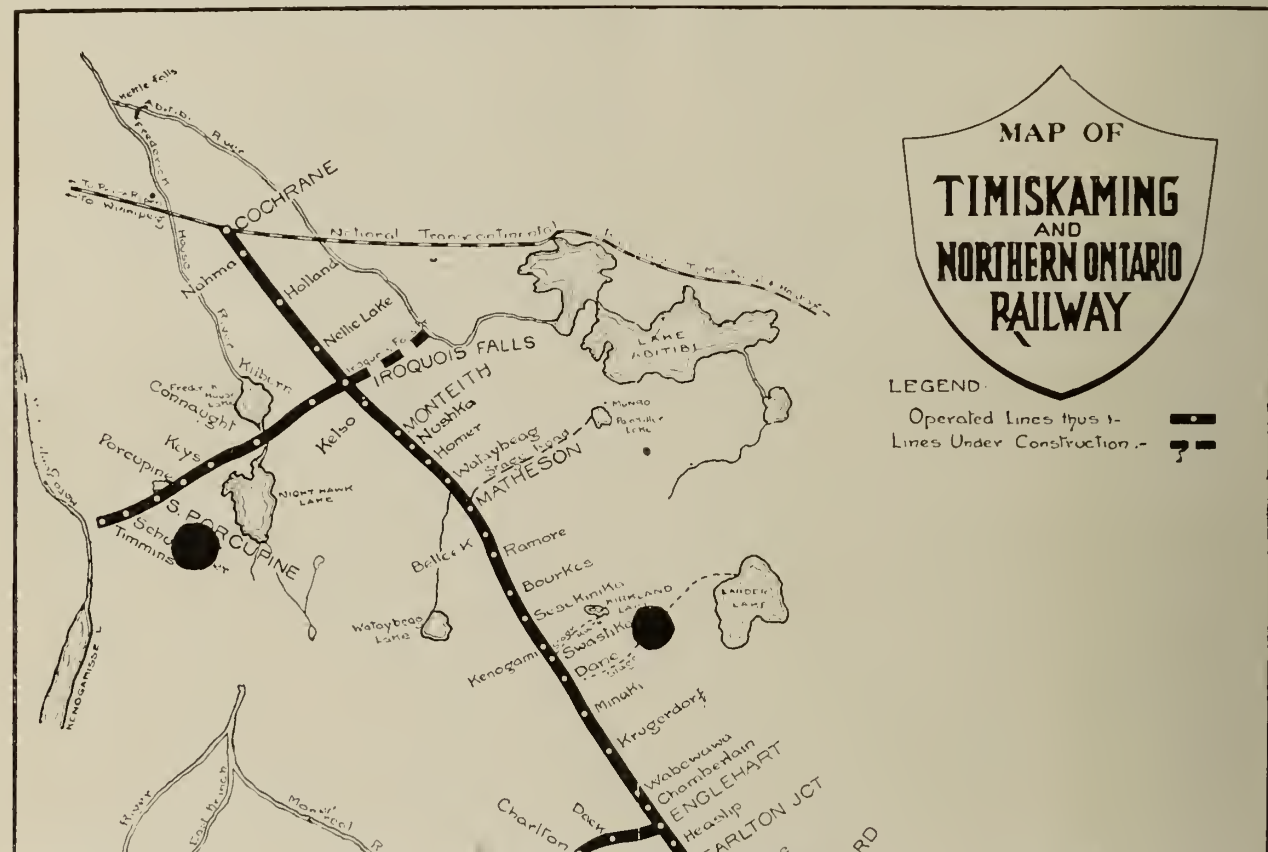
# KIRKLAND LAKE GOLD DEPOSITS

By Reginald E. Hore.

During the past year the development of prospects in the vicinity of Kirkland Lake, Ontario, has resulted in the discovery of important gold deposits. One property, although only equipped for exploratory work, is producing enough gold to pay all running expenses, while a shaft is being sunk on the vein.

**Location of the Goldfield.**—Kirkland Lake is situated in Teck township, close to the main line of the Temiskaming and Northern Ontario Railway. The nearest station is Swastika, which is 164 miles from North Bay and 61 miles north of Cobalt. At Swastika there are two small producing mines, Lucky Cross and Swastika. North and east of Swastika a trail leads to Kirkland Lake and Gull Lake, passing on the way across several properties, including the Wettlaufer, Oakes, Teck-Hughes, Robbins, and Foster, on which work is being done.

From the Foster mine to Swastika the owners have cut temporary roads and now the Ontario Government is building a permanent highway.




Map showing location of Sudbury, Cobalt, Porcupine and Kirkland Lake

**Discovery of Gold.**—The claims in this district were first staked in the Larder Lake rush of 1906 and 1907. For a few years very little was discovered, however, and it was not until 1912 that much of promise was found. During last summer gold was discovered on several claims; but the veins in which it occurred were small and not very continuous. Repeated testing, however, showed that gold occurs in considerable quantity in the rock enclosing thin quartz veins and numerous samples show good values to extend over a width of several feet.

The most extensive development work in the district has been done on claims now owned by Messrs. Foster, Tough and Oakes. The Foster property consists of six claims, four in Lebel and two in Teck township. The total area is about 210 acres. At present the exploration is all being done on one claim.

**The Foster-Tough-Oakes Claims.**—The chief gold deposits at the Foster property are designated as veins No. 1, No. 2 and No. 3. The No. 1, or discovery vein, is a narrow brecciated quartz vein enclosed in a reddish-gray feldspar-porphyry. From it some fair assays have been obtained, but in the opinion of the management it is not as promising as the No. 2 and No. 3.

**The No. 2 vein** is also a very narrow quartz vein; but the ore is rich and there are good values in the wall rocks for a width of several feet. The vein is in a gray conglomerate a few feet north of the contact between the sedimentary series and gray feldspar-porphyry. The contact and the strike of the vein run nearly parallel east and west. So far as can be judged from the arrangement of the pebbles in the conglomerate, this rock dips steeply to the south and, therefore, under the porphyry. According to Mr. Foster, the data so far obtained indicate that the conglomerate dips nearly at the same angle as the vein. So far as the workings have gone the dip is about 60 degrees to the south. The vein has been stripped as far as the rock surface could be easily cleaned—a few hundred feet—and a shaft on the vein is on July 28th, 175 feet deep, on the dip. From an open cut about 30 feet deep, shown in the accompanying photographs, two carloads of high grade ore were shipped. The shaft was then started in the bottom of the open cut. The surface exposure and the shaft excavation show the vein always thin and irregular in thickness and often branching into very thin seams of quartz. The main vein in several places is split down the middle and presents a graphite covered smoothed surface, as may be seen in the accompanying underground photograph, taken by Manager Chas. O'Connell and A. M. Hotchkins.

So far as the development has progressed, and it is being pushed as rapidly as the temporary equipment will allow, the vein shows very high values and the wall rocks contain pay values for the thickness mined. There is no waste rock being broken.

The shaft is sunk in the footwall and if the hanging wall proves as rich as the footwall there will be an ore-body of 15 to 20 ft. in thickness.

**Foster No. 3 Vein.**—Running about parallel to No. 2 vein and a few hundred feet north of it is another important deposit. This one is chiefly enclosed by porphyry; but towards the east traverses a fine grained gray ferrodolomite, and is further east enclosed by conglomerate. Some of the richest ore as determined by sampling is said to be that in the portion enclosed by the gray ferrodolomite. An analysis of this rusty weathering carbonate rock shows that it is highly siliceous. The following analysis is of a dense hard portion, silica 58.80, lime 4.50, magnesia 2.02, iron 3.62, carbon dioxide 6.03. The composition is much like that of an alkali porphyry which has been weathered. Compare this analysis with the one below.

This vein has not been tested to any extent since it was stripped and sampled, and nothing is yet known as to its continuity with depth.

**Tough-Oakes Mine, tramway and mill, Kirkland Lake, Ont.**

**Tough-Oakes Mine and Mill.**—The shaft on No. 2 vein is a two compartment inclined one measuring 6 x 10 ft. inside timbers. It has been broken considerably larger than necessary as the opening is all in ore and no endeavour is made to keep it very small.

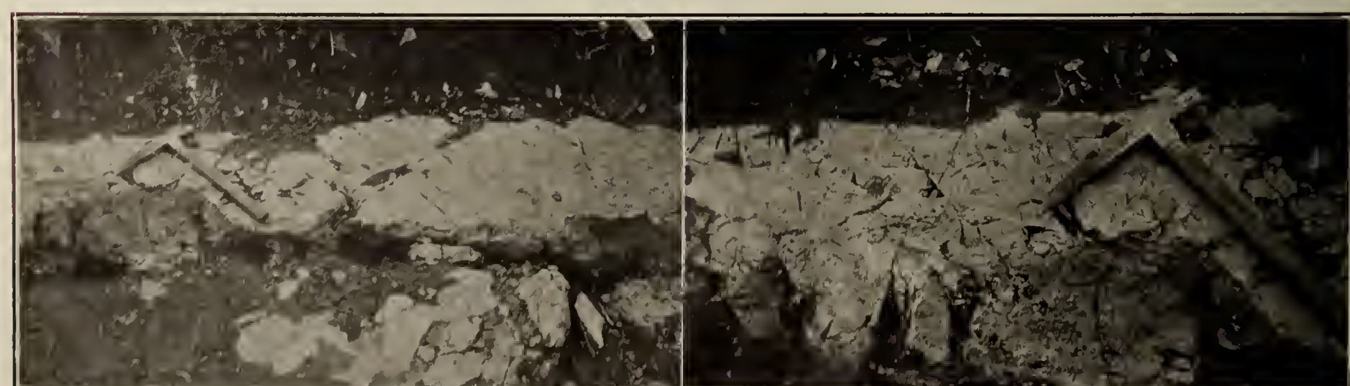
In sinking, two one-man hammer drills and hollow steel are used. The drillers have one helper between them. In the first month of sinking the miners made 100 ft.

The conglomerate rock is rather easily drilled and in one shift enough is broken to keep two shifts busy

Ed. Note.—Just as we go to press we are advised that the name Tough-Oakes Mines, Ltd., has been chosen as the official name of the property referred to in this article as the Foster or Foster-Tough-Oakes.

**No. 1. vein, Tough-Oakes Mine. Gold quartz in brecciated porphyry**

**Conglomerate in which gold quartz veins occur, Tough-Oakes Mine, Kirkland Lake, Ont.**



**Two views of No. 2 vein, a gold quartz vein in conglomerate, Tough-Oakes Mine.**

Two views of Wettlaufer property, Kirkland Lake, Ont.

Two views of gold bearing porphyry. Wright-Hargraves property

Gold quartz vein in porphyry. Wright-Hargraves property

No. 3 vein, Tough-Oakes property

Tough-Oakes Mine, looking west.

Tough-Oakes Mine, looking towards hanging side mucking. The men work 8 hours, and there are three shifts.

The rock broken is hoisted by bucket to surface and there loaded in a tramcar and elevated to the mill or piled on the stockpile. There is excavated in sinking about 25 tons per day and the 5-stamp mill can only treat 11 or 12 tons of this. In blasting, 40 per cent. dynamite is used. The holes for the cut are drilled about 7 ft. and for the bench about 6 ft.

**The Mill.**—The mill is an Allis-Chalmers 50 B battery, 5 stamps of 1,050 lbs. It is driven by a 30 h.p. slide valve engine. The crusher is a 7 x 10 Blake. The mortar block is of wood set in solid rock. The screen is a Toncap 40 mesh. The mill cost $6,000, and was erected in 28 days. It treats about 11 tons per day, making a recovery of about 75 per cent. of the values. About 65 per cent. is recovered inside the mortar, and about 10 per cent. on the outside plates. The mill tails contain about $11 per ton, and are being ponded for future treatment.

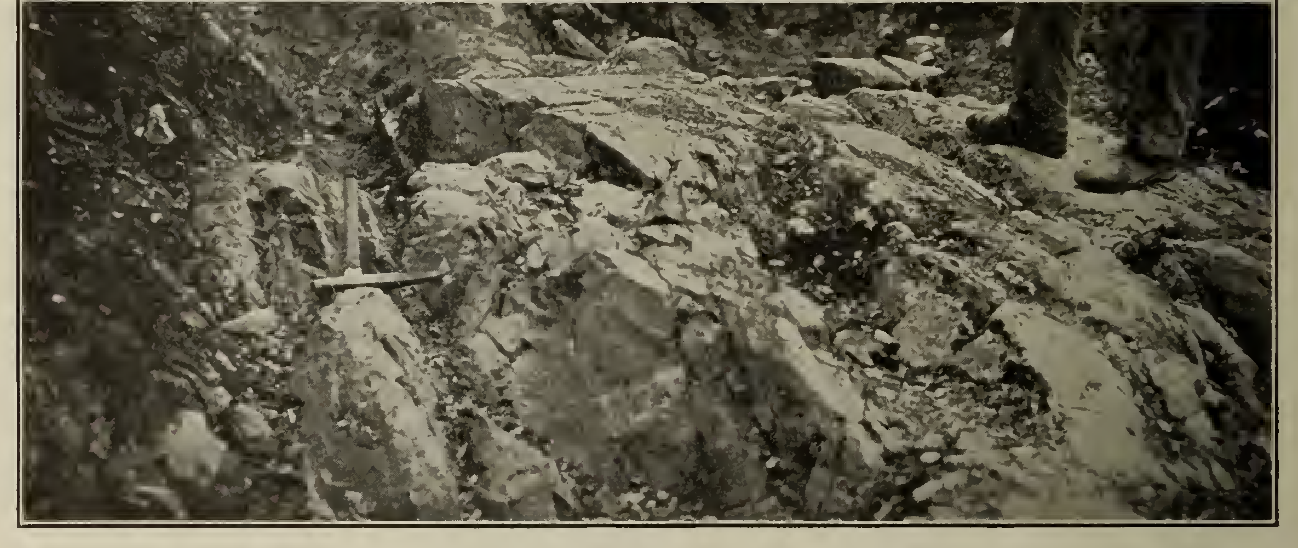
The mill was started May 14, 1913, and has been in continuous operation since. Two bars have been melted one weighing 231 ozs. and the second 122.5 ozs. The first bar was 821.7 fine, and the second 868, so the total

with graphite. In several cases there are slickensided black walls spotted with small flakes of gold. The main longitudinal fracture in No. 2 vein at the Foster mine has afforded numerous specimens of such ore. Quite as common, though not so peculiarly characteristic of these deposits, is the occurrence of abundant pyrite with the gold. Much of the pyrite is in very small grains, and the microscopic examination of wall rocks shows that there are a very remarkable number of small pyrite crystals. Most of these are not in contact with one another; but scattered throughout the rock as single grains.

Some specimens show a little copper pyrites and others arsenopyrite. With these sulphides there is usually much secondary quartz, calcite and sericite, and in some cases chlorite.

Some specimens show gold grains wholly enclosed in calcite, and most specimens containing gold show some calcite.

All the observations are of a nature to make one conclude that the gold is much younger than the wall rocks. These have been remarkably fractured, and their minute particles crushed and broken before the deposition of the gold.



**No. 3 vein, Tough-Oakes property, Kirkland Lake, Ont,**

value was about $6,000. These two bars were shipped on June 27.

**Mode of Occurrence of the Gold.**—The gold occurs as native metal and as telluride. Particles of coarse gold are very common in the fracture planes in the quartz veins. The telluride has not been isolated and analyzed, but is supposed to be calaverite. It occurs with the native gold in rather poorly crystallized grains of a greenish bronze colour. The native gold and telluride while most abundant in the quartz veins occurs also in the wall rock. Native gold in coarse grains is, however, generally found in the veins rather than in the rock.

A very remarkable feature of the deposit is the abundance of black graphitic mineral in the gold bearing portions. Nearly all the rich ore contains much graphite, and, according to Mr. Chas. O'Connell, it has been found that graphite is a very good indication of values. In some of the veins nearly all the samples of quartz showing graphite contained gold.

A common mode of occurrence of coarse gold is on fracture faces or walls of quartz veins which are black

It has been noticed that where gold occurs in porphyry wall rock the latter is much decomposed. Fresh unaltered porphyry is regarded by the experienced prospectors as less promising than the altered zones.

A peculiar feature of some of the deposits is the considerable content of gold, despite the meagre size of the quartz veins. It seems that the rocks have been very much fractured along zones rather than broken by extensive fissures. Seldom are the quartz veins more than a few inches in width, but narrow veinlets are remarkably numerous.

It is very difficult to determine the nature of the deposits without doing considerable work. Stripping must be followed by much breaking of the rock and panning of all showings of quartz however small. As the quartz is not readily distinguished from the light colored porphyry, the small veins are easily overlooked.

**The Porphyry Wall Rock.**—The igneous rock in which many of the veins occur is a light coloured, very feldspathic porphyry. Some thin sections show the chief constituents to be feldspar phenocrysts, in a fine grained siliceous ground mass. Other specimens examined microscopically show numerous greenish colored micaceous and chloritic patches, which have probably resulted from the alteration of ferromagnesia silicates, such as biotite and hornblende.

In some sections, notably one taken from near No. 1 vein on the Foster property, the phenocrysts are chiefly orthoclase. Other specimens, including some from the same property, show the chief feldspar to be one of the plagioclases, of rather basic composition. There are evidently varieties of porphyry to be distinguished by different names; but they can all be conveniently referred to as feldspar-porphyry, as some member of the feldspar series is generally the most conspicuous mineral in the rock.

The porphyry is very hard and dulls the drills quickly. Slow progress is made, therefore, in excavating it, and this is one of the reasons why at the Foster mine the No. 2 vein in the conglomerate was chosen for development before No. 3, which at the outcrop is also very promising.

An analysis of a specimen of porphyry from the Foster property showed, silica 59.10, alumina 23.59, iron 2.25, lime 4.13, magnesia 1.56, $K_2O$ 3.31, $N_2O$ 4.23. This analysis shows the rock to be very high in alkalies.

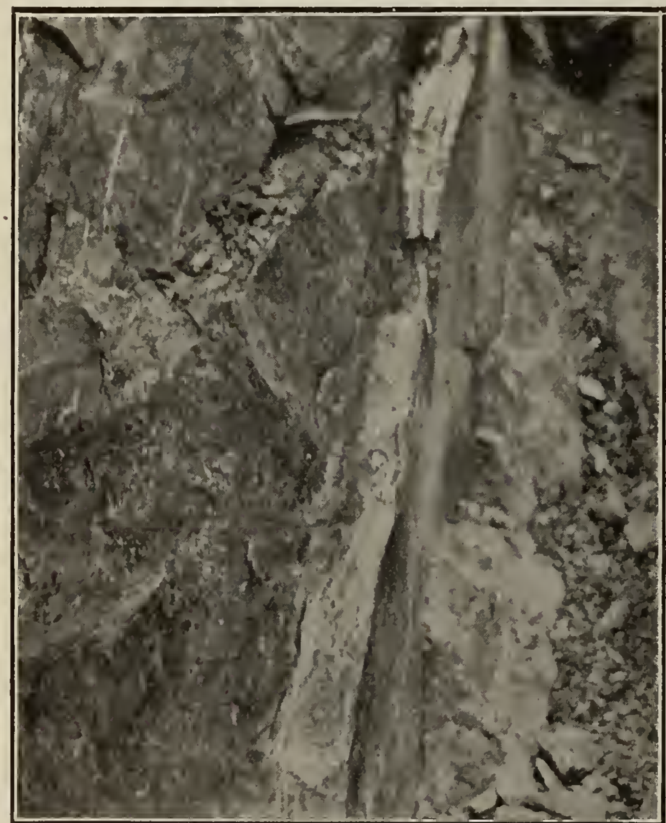
**The Conglomerate Wall Rock.**—The rock in which the No. 2 vein occurs, as may be seen by the accompanying photographs, is a conglomerate. It is in some respects similar to that at the Dome mine, being a gray schistose conglomerate, with numerous pebbles of

**Gold quartz vein in conglomerate, 100 foot level, Tough-Oakes mine, Kirkland Lake, Ont.**

porphyry, greenstone and chert. It differs somewhat, however, in other respects, notably in containing a large number of red jasper pebbles and being more extensively fractured. The rock contains remarkably numerous fractures, large and small, many of which have been filled by quartz or calcite.

Microscopic examination of thin sections of this rock —sections and microscope were placed at the writer's disposal while at the property by Chas. Spearman, superintendent of operations for the adjoining property owned by the Burnside syndicate—show that the fracturing is not confined to large cracks, but that many of the individual grains of the rock, especially the quartz grains, have numerous minute fractures.

By the naked eye it is readily noted that individual pebbles of the conglomerate have been broken into many pieces. The hard jasper pebbles show numerous cracks. Secondary minerals are common on the fracture faces, and several jasper pebbles examined show



**Gold quartz, vein in porphyry, Robbins claim, Kirkland Lake**

pyrite. One of the miners reports having found a jasper pebble which showed free gold on the fractured surface.

Microscopic examination of the ground mass of the conglomerate reveals a poorly sorted aggregate, largely composed of quartz, sericite and carbonates. In addition to the fractured and evidently older quartz grains, there are patches and veins of younger quartz and of calcite.

A small jasper pebble in one section shows numerous fractures, which have been filled with secondary silica. The jasper has somewhat of an oolitic structure, the red coloring matter being in circular bands.

The rock at a depth of 170 feet is quite like that at the surface. The bottom of the last cut, when examined by the writer, showed coarse conglomerate, numerous grey and greenish pebbles and occasional red jasper pebbles.

According to Mr. Foster's observations, the conglomerate shows quite distinct banding of coarse and fine portions. In some places there is just a single line of pebbles; but more commonly the conglomeratic portion is thick. Mr. Foster states that in sinking the shaft it was noticed that the vein follows the coarse pebbly portion. It left this for a short distance, and was enclosed in fine grained sediment; but after a few feet it was found to run into the conglomerate again. The pebbly layers are less strong than the fine-grained and have been more fissured.

Charles Spearman states that on the adjoining property of the Burnside Syndicate, the conglomerate is standing nearly vertical.

**Character of the Ore.**—It will be noticed from the record of shipments that the proportion of silver to gold has increased somewhat with depth. It has also been observed that the proportion of tellurides is greater at depth than at surface. Tellurides were first noticed at a depth of about 18 feet, but may have occurred nearer surface also.

The ore is rather easily broken in the mine and in the mill. About 75 per cent. of the gold is recovered by amalgamation, and the tails are being ponded for future treatment.

The graphite presents no serious difficulty in the mill, as it floats off very readily when the ore is crushed.

**Vein from mill looking over shaft, Tough-Oakes mine**

**Gold Production of Foster Mine to Date.**—It was in July 15, 1912, that Mr. Foster took over the controlling interest in the Tough-Oakes properties. At first considerable attention was devoted to No. 1 vein; but soon it was found that No. 2 and No. 3 were much more promising. After the preliminary exploration by stripping, it was decided that the further development work should be first done on No. 2 vein. A small shipment, A, about two tons of ore, broken from the outcrops of several veins, was made in September, 1912.

Work at No. 2 vein was carried on at first by an open excavation about 30 feet deep. From the ore broken the high grade portion, or vein material, was picked out and bagged for shipment. Two cars, known as lots B and C, were obtained in this way. The weight and value of the high grade ore is indicated in the accompanying table of shipments.

The open cut work was discontinued at a depth of 30 feet, and equipment was installed for sinking. A shaft was put down on the vein. The ore broken in sinking the shaft was sorted, and when a depth of 100 feet had been reached, another car load, lot D, of high grade ore had been produced. Since that time no shipments have been made, though a few tons of high grade has been bagged. D shipment is expected to yield fully as high returns as B and C, but settlement for the shipment has not yet been made and the actual figures are therefore not published here.

In picking the ore for shipment, the high grade was not all saved. The high grade fines were hoisted with the lower grade ore, and will be treated in the mill.

According to Mr. Foster the high grade shipments made correspond in volume to a thickness of about 4 inches of vein material. The records indicate the average thickness of vein material to be about double this width, so it is evident that a considerable portion of the high grade is mixed with the wall rock now on the stock pile.

The production of gold from milled rock is given above—about $6,000 being obtained in the first two melts.

**Gold Ore Shipments From Foster-Tough-Oakes Claims.**

| | | | Weight | Yield per Ton Ounces | | Total Yield Ounces | |
|---|---|---|---|---|---|---|---|
| Shipment. | Source. | Date. | Tons. | Gold. | Silver. | Gold. | Silver. |
| A | From outcrops of 5 veins other than No. 2........ | Sept. 1912 | 2. | 18. 2 | 24. 8 | | |
| B | Open cut, No. 2 vein....... | Feb. 15 | 19.985 | 22. 5 | 23. 4 | 448.04 | 465.77 |
| C | Open cut, No. 2 vein....... | Mar. 19 | 21.527 | 19.688 | 33.665 | 403.67 | 690.93 |
| D | Shaft above 100 ft......... | June 4 | | | | | |

**Value of Shipment.**

| | Gold. | Silver.. | Gold and Silver. |
|---|---|---|---|
| A | | | |
| B | $8,960.80 | $274.80 | $9,235.60 |
| C | 8,073.40 | 493.96 | 8,567.36 |
| D | | | |

On the ore shipments the charges for freight, sampling and treatment amounted to $26.50 per ton. When ore was being stoped, the total cost per ton was about $68.00.

The stock pile of milling ore on June 28 is estimated by Mr. O'Connell, manager of the property, to contain about 2,500 tons. This is being added to from development work at the rate of about 12 tons per day.

**Plans for Increasing Production.**—If the development work continues to give such results as have been obtained to date, a large mill will be erected. A considerable production is already assured and mining and milling equipment will be hauled in as soon as the road is made ready for heavy traffic.

It is hoped that hydro-electric power may be obtained. Otherwise a Deisel engine unit may be installed at Swastika. A metallurgical expert will be employed to work out a process of treatment of the ore.

While the lack of roads prevents the installation of machinery, preparations are being made for production on a large scale.

Mr. Chas. O'Connell, formerly manager of the Trethewey mine, is now manager of the Tough-Oakes. Mr. A. M. Hotchkin is assistant manager, J. A. Murphy, mine superintendent, and Fred Jost, mill superintendent.

**Government Geological Maps.**—The Ontario Bureau of Mines has a party in the district making a geological map. Mr. A. G. Burrows is in charge of this work, and Messrs. P. E. Hopkins and M. E. Smith are assisting him. Six townships are being surveyed, and it is hoped that the map will be ready in August Last year the Bureau of Mines published a geological map prepared by E. L. Bruce which shows the distribution of the rocks in the neighbourhood of Swastika. Mr. Burrows' map will show the contiguous area.

# SUDBURY, COBALT AND PORCUPINE

The mineral production of Canada is increasing rapidly and the future of the mining industry in this country is generally conceded to be more promising than in any other country in the world. The developments of the last decade have proven that our mineral resources are greater than anyone could have hoped, that there are rich deposits of precious metals a few hundred miles from our chief centres of population and that we have vast areas of promising territory awaiting exploration.

**Mineral Production During the Year 1912**—As shown by the report of Mr. John McLeish, chief of the Division of Mineral Resources and Statistics, Department of Mines, the total value of the mineral production in Canada in 1912 was $133,127,489, an increase over the preceding year of 29 per cent. or $29,906,495. The per capita production in 1912 was over $18.00.

Of the total production, $61,177,989 or about 46 per cent. is credited to the metals, and $71,949,500 or about 54 per cent. to non-metallic products.

Of the several provinces Ontario was the largest contributor to the total, being credited with $51,023,134; British Columbia second, with $29,555,323; Nova Scotia third, with $18,843,324; Alberta fourth, with $12,110,960 and Quebec fifth, with $11,675,682.

The production of the more important metals and minerals is shown in the following tabulated statements:

**The Mineral Production of Canada in 1912.**
(Subject to Revision)

**Non-Metallic.**

| Product. | Quantity. | Value. |
|---|---|---|
| Actinolite, tons | 92 | 1,000 |
| Arsenic, white, tons | 2,045 | 88,726 |
| Asbestos, tons | 106,520 | 2,959,677 |
| Asbestic, tons | 24,740 | 19,707 |
| Coal, tons | 14,699,953 | 36,349,299 |
| Corundum, tons | 1,960 | 239,091 |
| Feldspar, tons | 12,233 | 25,416 |
| Fluorspar, tons | 40 | 240 |
| Graphite, tons | 2,060 | 117,122 |
| Grindstones, tons | 2,912 | 44,290 |
| Gypsum, tons | 576,498 | 1,320,883 |
| Manganese, tons | 75 | 1,875 |
| Magnesite, tons | 1,714 | 9,645 |
| Mica, tons | ...... | 104,393 |
| Mineral pigments— | | |
| Barytes, tons | 464 | 5,104 |
| Ochres, tons | 5,654 | 30,410 |
| Mineral water | ...... | 169,467 |
| Natural gas | ...... | 2,311,126 |
| Peat, tons | 700 | 2,900 |
| Petroleum, value at $1.418 per bbl., bbls. | 243,336 | 345,050 |
| Pyrites, tons | 79,702 | 348,026 |
| Quartz, tons | 100,242 | 195,216 |
| Salt, tons | 95,053 | 459,582 |
| Talc, tons | 8,270 | 23,132 |
| Tripolite | 38 | 230 |
| Total | ...... | $45,171,607 |

| Products | Quantity | Value |
|---|---|---|
| **Metallic.** | | |
| Copper, value at 16.341c. per lb., pounds. | 77,775,600 | $12,709,311 |
| Gold, ounces | 607,609 | 12,559,443 |
| Pig iron from Canadian ore, tons | 36,355 | 450,886 |
| Iron ore sold for export, tons | 118,129 | 382,005 |
| Lead, value at 4.467c. per lb., pounds | 35,763,476 | 1,597,524 |
| Nickel, value at 30c. per lb., pounds | 44,841,542 | 13,452,463 |
| Silver, value at 60.835c. per oz., ounces | 31,931,710 | 19,425,656 |
| Cobalt and nickel oxides | ...... | 319,785 |
| Zinc ore, tons | 6,723 | 280,886 |
| Total | ...... | $61,177,989 |
| **Structural Materials and Clay Products.** | | |
| Cement, Portland, barrels | 7,120,787 | 9,083,216 |
| Clay products— | | |
| Brick, common, pressed, paving | ...... | 7,601,380 |
| Sewerpipe | ...... | 887,641 |
| Fireclay drain tile, pottery, etc. | ...... | 854,140 |
| Kaolin, tons | 20 | 160 |
| Lime, bushels | 7,992,234 | 1,717,771 |
| Sand and gravel (partial record only) | ...... | 1,066,326 |
| Sand-lime brick | ...... | 882,469 |
| Slate, sq. | 1,894 | 8,939 |
| Stone— | | |
| Granite | ...... | 1,257,770 |
| Limestone | ...... | 2,820,832 |
| Marble | ...... | 272,236 |
| Sandstone | ...... | 325,013 |
| Total structural materials and clay products | ...... | $26,777,893 |
| All other non-metallic | ...... | $45,171,607 |
| Total value, metallic | ...... | $61,177,989 |
| Grand total, 1912 | ...... | $133,127,489 |

The subdivision of the mineral production in 1911 and 1912 by provinces was approximately as follows:

| | 1911 | | 1912 | |
|---|---|---|---|---|
| Province. | Value of production. | Per cent. of total. | Value of production. | Per cent. of total. |
| Nova Scotia | $15,409,397 | 14.93 | $18,843,324 | 14.15 |
| New Brunswick | 612,830 | 0.59 | 806,584 | 0.61 |
| Quebec | 9,304,717 | 9.01 | 11,675,682 | 8.77 |
| Ontario | 42,796,162 | 41.46 | 51,023,134 | 38.33 |
| Saskatchewan | 636,706 | 0.62 | 909,934 | 0.68 |
| Manitoba | 1,791,772 | 1.74 | 2,314,922 | 1.74 |
| Alberta | 6,662,673 | 6.46 | 12,110,960 | 9.10 |
| British Columbia | 21,299,305 | 20.63 | 29,555,323 | 22.20 |
| N.-W. Territories | 4,707,432 | 4.56 | 5,887,626 | 4.42 |
| Dominion | $103,220,994 | 100.00 | $133,127,489 | 100.00 |

In Ontario the mineral production is largely metallic. Silver, gold, nickel, copper, iron and cobalt are the metals produced. Of non-metals, brick, cement and natural gas are the leaders. There are about 11,000 men employed in the metal mining industry in Ontario and they receive in wages an average of about $800 per year.

The chief source of silver is the Cobalt district, of nickel and copper the Sudbury district, and of gold the Porcupine district.

profit from nickel in the Sudbury ores soon became greater than that from the copper, and in late years the operating companies have been very successful.

The known ore reserves are very large and there are numerous promising properties yet undeveloped. Increased yield in future years is therefore to be expected.

In the recently issued report of the International Nickel Co., which derives most of its profits from mining and treating Sudbury ores, President Ambrose Monell says:

"During the fiscal year just closed the business of the company has shown a substantial and satisfactory growth. The improved conditions in the steel industry resulted in a greatly increased demand for nickel from the steel makers, and in all other industries in which the company's products are used the demand has been the best in the history of the company. All indications point to a very satisfactory business for the coming year.

"We are continuing our policy of keeping our plant up to date in every respect, of increasing its efficiency wherever possible, and of enlarging its capacity."

The following table from the report of Thos. W. Gibson, Deputy Minister of Mines, Ontario, summarizes the operations during the years 1907 to 1911. The final figures for 1912 have not yet been published; but it is known that they will show a large increase over previous years.

The nickel producing companies in the past year were the Canadian Copper Co., (controlled by the International Nickel Co.), and the Mond Nickel Co. The formation of a third company to develop has quite recently been announced. This is the Canadian Nickel Corporation, Limited, capitalized at $30,000,000. Among those interested in the new venture are Dr. F. S. Pearson, President of the Brazilian Traction, Light, and Power Co., and of many other South American corporations; Mr. J. Frater Taylor, Vice-President and Managing Director of the Lake Superior Corporation; Mr. J. E. McAlister; Mr. B. B. Lawrence, Consulting Engineer, New York; Mr. E. R. Wood; Mr. Walter Gow and Mr. Miller Lash.

**The Cobalt Silver Mining Industry.**—The development of the Cobalt district has been so spectacular that

### Nickel-Copper Mining in Ontario, 1907 to 1911.

| Schedule. | 1907. | 1908. | 1909. | 1910. | 1911. |
|---|---|---|---|---|---|
| Ore raised, tons | 351,916 | 409,551 | 451,892 | 652392 | 612,511 |
| Ore smelted, tons | 359,076 | 360,180 | 462,336 | 628,947 | 610,783 |
| Bessemer matte produced, tons | 22,041 | 21,197 | 25,845 | 35,033 | 32,607 |
| Nickel contents, tons | 10,602 | 9,563 | 13,141 | 18,636 | 17,049 |
| Copper contents, tons | 7,003 | 7,501 | 7,873 | 9,630 | 8,966 |
| Value of nickel (dollars) | 2,270,442 | 1,866,059 | 2,790,798 | 4,005,961 | 3,664,474 |
| Value of copper (dollars) | 1,020,913 | 1,062,680 | 1,122,219 | 1,374,103 | 1,281,118 |
| Wages paid (dollars) | 1,278,694 | 1,286,265 | 1,234,904 | 1,698,184 | 1,830,526 |
| Number of men employed | 1,660 | 1,660 | 1,796 | 2,156 | 2,439 |

**The Sudbury Nickel-Copper Industry.**—The Sudbury district is the world's chief source of nickel. The deposits were originally worked for copper by the Canadian Copper Co. in 1887. Cars of picked ore were shipped to eastern refiners and the difficulty experienced in treating the ore for its copper contents led to the discovery of the presence of nickel with the copper. There was at that time no available method of separating nickel from the copper, and a period of experimentation followed. A process was finally found and it then became necessary to find a market for the large quantity of nickel available, for the amount then used was very small.

Fortunately about this time, 1890, the valuable properties of nickel-steel became known and the nickel industry was then established on a substantial basis. The the general public has heard much of this wonderful storehouse of silver. The recent progress has been very satisfactory.

### The First Discovery of Silver at Cobalt.

During the summer of 1903 men were working west of Lake Temiskaming on the construction of the Temiskaming and Northern Railway. This road was built by the Government to open agricultural land beyond the district now known as the Porcupine gold field in Northern Ontario. In the vicinity of a narrow unnamed lake, later known as Cobalt Lake, some of these railroad men noticed peculiar minerals in the rocks. Fred La Rose, blacksmith of the gang, spent considerable of his spare time in examining the mineral-stained rocks at the edge of a little swamp, where he found some loose ore and subsequently a deposit in place. He mistook niccolite for a copper mineral, and continued his prospecting without realizing that he had found a rich vein of silver-bearing ore.

At the south end of Cobalt Lake, James McKinley and Ernest J. Darragh found the first specimens of native silver which were recognized as such. These men were lumbermen engaged in getting out ties for the railroad, and they made a practice of prospecting whenever opportunity afforded. While making their way around the south end of one of the numerous lakes skirted by the railroad, their attention was attracted by the colour and weight of some loose pieces of rock in the shore gravel. These they found on washing to be rich ore, and on August 14 they applied for a mining location. Their affidavit of discovery, sent in on October 6, states that on August 7, 1903, they found rock containing "a goodly percentage of free or native silver," and assays of samples sent to Montreal showed several thousand ounces per ton. Their claim of 32 acres is now the chief holding of the McKinley-Darragh-Savage Mines Co.

In the meantime LaRose had been digging away at his pink-stained ore, and on September 15 he found a vein of solid "copper," which he showed to his employer, Duncan McMartin. Together they staked out two claims, and on September 19, 1903, applied for a location at the 103 mile post, a quarter mile north of Cobalt Lake. The claim of 40 acres containing the original discovery is the chief producer of the LaRose Con. Mines Co., while the second claim has been known as the LaRose Extension. LaRose apparently did not recognize the native silver, which was abundantly disseminated through the niccolite, until it was pointed out to him by Dr. W. G. Miller, who visited the camp in November.

On October 8, 1903, Neil A. King, a fire ranger on the T. and N. O. Railway, filed a claim for 160 acres, including the LaRose property. In the suit which followed LaRose was given a clear title to his claim, while King's supporters, J. B. O'Brian and M. J. O'Brien, received the adjoining property on agreeing to pay to the province a royalty of 25 per cent. of the gross value of ore raised to the surface.

Considerable prospecting was done in the vicinity of Cobalt Lake by those who recognized the richness of the deposits. Messrs. A. Ferland, Thos. Hebert and R. R. Galbraith made two important finds in October. One of these—the Cobalt Hill vein—was a vein of solid cobalt ore on the east shore of the lake. The second was a narrow vein in the cliff south-east of the lake. It was very rich in native silver, and became known as the "Little Silver" vein. These properties were located on October 22, and subsequently called the Chambers-Ferland claims. They are now part of the holdings of the Nipissing Mines Co. All four of these discoveries were narrow veins, filling vertical fissures in Huronian conglomerate, quartzite and shaley greywacke. Three of them showed native silver with smaltite and niccolite, while the fourth was largely smaltite.

Specimens of the niccolite from LaRose's discovery were shown by A. Ferland to Thos. W. Gibson, director of the Ontario Bureau of Mines, and as a result the discoveries were examined by Dr. W. G. Miller in November. After this examination, official announcements of the nature of the deposits were made in the daily press and in technical journals in December, 1903. These announcements aroused considerable interest, but, nothing being known of the extent of any of the deposits, few mining men investigated further. One of the few was E. P. Earle, of New York, whose attention was attracted by the descriptions of cobalt ore given by Prof. Miller. Mr. Earle later visited the camp and secured the property now known as the Nipissing.

During the winter and spring a number of claims, including properties which subsequently became important producers, were staked; but no important veins were discovered for seven months. W. G. Trethewey, an experienced prospector, had his interest aroused by Dr. Milton Hersey, who had received specimens of silver ore from McKinley and Darragh for assay. Trethewey saw more of the ore at the Bureau of Mines office in Toronto, and gathered information regarding the country and its mining laws. Leaving Toronto on May 15, 1904, he reached Haileybury two days later and Cobalt Lake on the day following. After examining the early discoveries he began to prospect himself, and on May 23 he found two veins on the hill north-west of the lake. Two claims of 40 acres each were applied for. These are the properties now known as the Coniagas and Trethewey.

Following the success of Trethewey, a number of claims, including the Buffalo, were staked on less valuable finds; but not until July was another notable discovery of silver made. Up to this date all the known deposits were veins in Huronian conglomerate. Now silver was found in the diabase at Cross Lake. Then in quick succession followed discoveries at Kerr and Giroux Lakes, including one in the Keewatin greenstones. By the end of the season of 1904 all the exposed rocks in the producing area at Cobalt had been more or less carefully examined.

In October, 1904, steel on the T. and N. O. Railway reached Cobalt Lake, and several rich shipments were made during the winter. Some of the car lots of hand-sorted ore netted about $2,000 per ton, and much outside interest was at once aroused. In the spring of 1905 a large number of prospectors began work in the district, and in addition to the work being done at Cobalt, rocks in more remote parts were subject to close scrutiny. Fortunately the surrounding country had been described and geologically mapped 10 years earlier by Dr. A. E. Barlow, of the Canadian Geological Survey. The prospectors were thus early aware that rocks similar to those in which they saw silver ores at Cobalt had been found over a large area to the westward.

In the spring of 1904, Dr. Miller, for the Ontario Bureau of Mines, and Dr. Parks, for the Canadian Survey, went to Cobalt to make official reports on the camp. Dr. Miller made a map of the immediate vicinity. Dr. Parks spent a few weeks examining the discoveries, and then went northwards to the height of land and across to the Montreal River to determine the areal extent of the silver-bearing rocks. With these and Barlow's reports, the crowd of prospectors had during the following years much useful information regarding the country they were working in.

### Discoveries in 1905.

The prospectors now in the district had two chances before them. Some believing that the field would prove an extensive one made hurried examinations of the outcrops over a large territory. Others stayed close to the proven area and began a system of prospecting which proved to be very profitable, namely, digging of narrow trenches to bed rock through the glacial debris. In this way many very important finds have been made.

Most of the valuable discoveries were, like the first ones, in Huronian sediments. Some rich veins were found, however, in the diabase and in the Keewatin series. All of them were deposits of very similar form and composition—narrow, vertical veins carrying silver and arsenides of cobalt and nickel.

Those who went far from Cobalt found cobaltiferous deposits in widely separated areas in rocks similar to those of Coleman township.

The prospectors at first gave their attention almost entirely to outcrops of conglomerate such as they had seen at Cobalt Lake. For some time little was found outside of Coleman and Bucke townships.

**Silver Found in Casey Township.**

The first important location of a similar nature at a distance from Cobalt was made in Casey township, 15 miles north of the camp, by David Bucknell. Mr. Bucknell had been attracted to Cobalt from his father's home on the Blanche River, and was for some time engaged in clerical work. He observed that the deposits were in rocks which resembled those at home. On returning home one day, he immediately set out to examine an outcrop on a neighbour's farm. After a short search he found a vein and located the property now known as Casey Cobalt. Later other small veins were found on adjoining properties, but the only ore shipped has been mined on the claims first staked.

It was three years after Bucknell's discovery of this field, before important discoveries were made in Huronian sediments in another part of Nipissing, on the Blackburn property at Miller Lake—now Millerette mine.

While the first discoveries were all found in Huronian sediments, the prospectors in Coleman township soon found that similar, though generally less productive veins, occurred in the other rocks.

In the western part of Coleman cobalt ore was found in diabase in the vicinity of Portage Bay on the Montreal River, and during the same summer, 1905, small veins carrying smaltite in a quartzose gangue were discovered in Ingram township, 30 miles north of Cobalt.

The prospectors now began to regard the diabase with more favour, and their preference became more marked as the field seasons went by without any notable find being made in the sedimentary rocks.

Several occurrences of cobalt bloom in diabase were found during this year in the vicinity of Wendigo Lake; but the prospectors here did not find any silver, and their attention was soon diverted by the discovery of gold at Larder Lake, some 20 miles further north.

**Native Silver Found in Temagami Forest Reserve.**

A number of prospectors worked westward from Portage Bay and examined the country to and beyond Lady Evelyn Lake. During the fall of 1906, Messrs. White and Darby found several veins of cobalt and silver ore in a diabase ridge between Anvil Lake and Maple Mountain. Many prospectors had at this time gone up the Montreal River and were working for a few miles westward. Silver was found in James township and vicinity during the fall of 1906.

During the following winter hundreds of claims were staked in the vicinity of Maple Mountain and Elk Lake. The number of prospectors now in Nipissing was much greater than in any previous winter; but many of them were busily staking out gold claims at Larder Lake. The spring of 1907 saw a great rush into the Maple Mountain and Elk Lake territory. The diabase outcrops were subjected to close scrutiny by an army of fortune hunters, with the result that a large number of discoveries were made. Westward from Elk Lake, cobalt minerals were found in many places, notably near Bloom Lake, but no rich deposits were uncovered for some time.

**Silver Found in South Lorrain.**

While most of the prospectors were working in the Forest Reserve, a few were examining less well-exposed areas south-west of Cobalt. Late in the year 1907 discoveries of silver were made in South Lorrain, 16 miles from Cobalt station. During the winter 1907-1908 several claims were staked and other discoveries made. Most of these were in the Keewatin greenstones, some in the Keweenawan diabase, and all near the contact.

**Silver Found at Miller and Gowganda Lakes.**

The prospectors working westward from Bloom Lake in 1907 made several discoveries of cobalt minerals in diabase, and during the following winter and spring silver was discovered in the vicinity of Leroy and Miller Lakes. Then in August several silver-bearing veins were found west of Gowganda Lake.

No new silver field of importance has been discovered during the past few seasons, and most of the prospectors have been seeking gold.

Ten years ago there were in Nipissing only a few individuals who were at all interested in minerals, and very few of these were trained prospectors. There are to-day in the district hundreds of men experienced in mining and prospecting and well versed in woodcraft. It will probably be long before a twelve-month shall have passed, in which none of these energetic pioneers has made an important discovery.

While the prospectors were hunting new fields, the working mines at Cobalt were steadily developed. Some veins rich near the surface were found disappointingly low grade at depth, and others pinched out. Some workings in low grade ran into rich ore and several new veins were found. These are the every day occurrences in the camp, new finds being made which counterbalance the working out of others.

Cobalt silver mines had another very profitable year in 1912, netting the owners over $10,000,000 on a production of about 30,000,000 ounces, having a gross value of about $17,000,000. During the year $8,179,468 was distributed in dividends. The output was somewhat lower than in 1911, but the average selling price was considerably higher and costs remained about the same. The output for previous years is shown by the accompanying table from the report of the Deputy Minister of Mines, Thomas W. Gibson. The mines have now produced a total of about 170,000,000 oz. silver, valued at more than $90,000,000. After the year's operations most of the mines have as much ore in sight as in 1911 and should be large producers in 1913. Two or three of the producers, however, have very little in reserve and will probably show serious falling off unless new discoveries of high-grade ore are made.

Two properties, Cobalt Townsite and Cobalt Lake, have shown great improvement during the last two years. They paid dividends of $220,000 and $310,000 in 1912, and are expected to increase production in 1913. Nipissing, the largest producer, had a highly successful year and was able to build a costly low-grade mill out of profits without decreasing the dividends; $1,800,000 was distributed to stockholders during the year. Coniagas met with like success in mining and developing, and paid to stockholders $1,440,000 without decreasing the known reserves. Crown Reserve held its own and was able to pay $1,080,000 to shareholders. McKinley-Darragh-Savage found some unusually rich ore and distributed $898,000 from profits. La Rose did not develop as much new ore as was hoped, and the market value of shares fell to new low levels, but the company was able to pay 12 per cent. on its capitalization of $7,500,000 without decreasing the large surplus.

### Total Production, Cobalt Mines, 1904 to 1911.

| Year. | Shipments of Ore and Concentrates, Tons. | —Cobalt— Tons. | —Cobalt— Value | —Arsenic— Tons. | —Arsenic— Value. | —Silver— Ounces. | —Silver— Value. | Total Value. |
|---|---|---|---|---|---|---|---|---|
| 1904 | 158 | 16 | $19,960 | 72 | $903 | 206.875 | $111.887 | $136,217 |
| 1905 | 2,144 | 118 | 100,000 | 549 | 2,693 | 2,451,356 | 1,360.503 | 1,473,196 |
| 1906 | 5,335 | 321 | 80,704 | 1,440 | 15,858 | 5,401,766 | 3,667,551 | 3,764,113 |
| 1907 | 14,788 | 739 | 104,426 | 2,958 | 40,104 | 10,023,311 | 6,155,391 | 6,301,095 |
| 1908 | 25,624 | 1,224 | 111,118 | 3,672 | 40,373 | 19,437,875 | 9,133,378 | 9,284,869 |
| 1909 | 30,677 | 1,533 | 94,965 | 4,294 | 61,039 | 25,897,825 | 12,461,576 | 12,617,580 |
| 1910 | 34,282 | 1,098 | 54.699 | 4.897 | 70,709 | 30,645,181 | 15,478,047 | 15.603,455 |
| 1911 | 26,653 | 852 | 170.890 | 3,806 | 74,609 | 31.507,791 | 15,953.847 | 16,199,346 |
| Total | 139,661 | 5,901 | $736,762 | 21,697 | $306.288 | 125,971,971 | $64,322,180 | $65,379,871 |

### Table of Dividends Paid by Cobalt Silver Mining Companies.

| Name of Company | Authorized Capital | Capital Stock Issued | Par Value | Dividends 1911 | Dividends 1912 | Total dividends to end of 1912 |
|---|---|---|---|---|---|---|
| Beaver | 2,000,000 | 2,000,000 | 1 | $170,000 | $180,000 | $350,000 |
| Buffalo Mines | 1,000,000 | 1,000,000 | 1 | 440,000 | 270,000 | 1,617,000 |
| City of Cobalt | 1,500,000 | 1,500,000 | 1 | ........ | ........ | 138,375 |
| Cobalt Central | 5,000,000 | 5,000,000 | 1 | ........ | ........ | 192,845 |
| Cobalt Lake | 4,374,885 | 3,304,051 | 1 | ........ | 310,000 | 310,000 |
| Cobalt Silver Queen | 1,500,000 | 1,500,000 | 1 | ........ | ........ | 315,000 |
| Cobalt Townsite | 1,000,000 | 1,000,000 | 1 | ........ | 220,000 | 220,000 |
| Coniagas | 800,000 | 800,000 | 5 | 1,440,000 | 1,440,000 | 4,280,000 |
| Crown Reserve | 2,000,000 | 1,768,814 | 1 | 1,238,186 | 1,061,288 | 4,687,373 |
| Foster Cobalt | 1,000,000 | 915,588 | 1 | ........ | ........ | 45,000 |
| Kerr Lake | 600,000 | 600,000 | 5 | 990,000 | 600,000 | 4,320,000 |
| La Rose | 1,500,000 | 1,498,407 | 5 | 599,451 | 711,847 | 4,434,042* |
| McKinley-Darragh-Savage | 2,500,000 | 2,247,692 | 1 | 1,123,666 | 899,769 | 2,831,757 |
| Nipissing | 1,200,000 | 1,200,000 | 5 | 1,800,000 | 1,800,000 | 9,090,000 |
| Right of Way | 2,000,000 | 1,685,500 | 1 | 33,710 | ........ | 526,904 |
| Temiskaming and Hudson Bay | 25,000 | 7,761 | 1 | 116,451 | 209,847 | 1,706,520 |
| Temiskaming | 2,500,000 | 2,500,000 | 1 | 225,000 | 300,000 | 1,309,156 |
| Trethewey | 1,000,000 | 1,000,000 | 1 | 200,000 | 200,000 | 971,999 |

*Includes profits shared privately before incorporation.

Buffalo paid $320,000 and built a new amalgamation-cyanidation plant. Kerr Lake paid $600,000 and still has much rich ore in reserve. Temiskaming had a profitable year, paying $300,000 to stockholders, but as compared with some former years, has little high-grade in reserve. The same is true of the O'Brien mine. Beaver has been prosperous recently and is meeting with some success at greater depth than other Cobalt mines. The Temiskaming and Hudson Bay mine increased production and profits and paid dividends amounting to $209,000. Trethewey paid 10 per cent., but has little high-grade in reserve. Casey-Cobalt increased production, profits and reserves and should be a larger producer in 1913.

The most noteworthy discovery during 1912, aside from ore discovered on property of the large producers, was made by the Seneca-Superior. This company, operating on a lease from Peterson Lake Mining Co., opened a vein of high-grade ore under Cart Lake. A few shipments have been made and the property promises to be profitable.

While paying out handsome dividends during the last few years, the mines at Cobalt have also paid for construction of a large number of well equipped mills and cyanide plants. There are at Cobalt 17 mills with a total capacity of about 1,800 tons per day. Remarkable progress in treating the unique ore has been made. Straight concentration methods have been so adopted that a good recovery is now being made from low-grade ore. Cyanide methods have also proven suitable and the Nipissing company has just put in operation a plant of 200 tons daily capacity for the treatment of low-grade ore by cyanide. The Nipissing has in operation a remarkable process for treating the high-grade ore. The crushed ore is ground with mercury and cyanide solution in a tube mill and most of the silver amalgamates with the mercury. The silver is recovered and refined on the property and the bullion shipped is of high purity. A plant to treat ore in a similar way has been constructed during the year by the Buffalo Mines, Limited.

**Porcupine Gold Mining Industry.**—Gold was first found in the Porcupine district in important quantity in 1909. Rapid progress was made in developing the deposits; but disastrous forest fires in July, 1911, gave the industry a serious setback. Nothing daunted, the mine owners immediately began reconstruction of mining plants and mills, and in 1912 Ontario became for the first time in history an important gold producer. The Porcupine mines yielded gold valued at about $1,800,000 and there are assurances that a very much larger production will be made in 1913.

The leading mines are the Hollinger and Dome. The Hollinger ore is comparatively rich and the profit per ton is large. The Dome has a large deposit of much lower grade ore. Other properties in the vicinity of the Hollinger, including the McEnaney, Miller-Middleton and Dixon, McIntyre, Pearl Lake, and Jupiter have also made a good showing, although overshadowed by the Hollinger and Dome.

At the Hollinger, Manager P. A. Robbins reported the estimated ore reserves at the beginning of the year to be 644,540 tons, valued at $11,271,400. The profit made during the last half of the year was $600,664.42.

At the Dome the new mill built to replace that lost in the fire of 1911, treated in the period from March 23, 1912, to March 31, 1913, 101,812 tons ore, which yielded $1,043,995. The tonnage developed above the 45-foot level is estimated at 315,528 tons with a sampling value of $7.53 per ton.

From these brief statements it will be evident that Ontario has now two very important gold mines. The smaller mines in the district will also contribute much to the country's wealth. During the past year also, promising gold discoveries have been made at Kirkland Lake, about 50 miles north of Cobalt, and there can be little doubt that the country traversed by the Temiskaming and Northern Ontario Railway will long be a very important mining district.

# THE MINING ENGINEER AND THE PUBLIC*

By Bedford McNeill.

In these days of specialized professions the tendency is more and more for the mining engineer and metallurgist to limit himself within the narrow boundaries of the mining, or the treatment of the ore of that particular metal, with which his life's work may be associated. There are manifest advantages, however, in extending our enquiries and knowledge with regard to the metals with which we are associated, and, as it were, taking a more extended view of their influences and uses in our complex civilization.

It is no use ignoring or pretending to ignore, the fundamental fact that mining is and must always continue to be essentially speculative, and so far as its initial operations are concerned it will, in my opinion, become more speculative in the not very distant future. Attention has already been drawn in our Transactions to the extent to which deposits at or near the surface are being more and more worked out, although as we all know, there are still large areas of the world's surface yet to be properly prospected. We may ultimately be driven to working that class of mineral occurrence which presents no visible evidence whatever at surface, and the location and working of which will inevitably demand higher technical skill and involve greater risk of loss of capital than those deposits with which we have at present mainly to deal.

Each successive advance of the science of mining ought to tend to equalize its increasing hazards. We are limited by our present knowledge, and although the difficulties met with stimulate our exertions to overcome them, we have still to work with insufficient enlightenment in regard to certain natural laws. At practically all points (commencing at a minimum when prospecting) the mining engineer is in close contact with finance. It is in connection with the finding and the losing of capital that so many difficulties and perils occur to the members of our profession.

If we consider the life-history of a mine, we are faced at once with a very practical point—the provision of the necessary working capital—and we must consider the relations between the mining engineer and capitalist. I know there are some mining engineers (belonging rather to the opulent section of our community) who argue, that if a mining enterprise cannot have the capital they estimate to be necessary therefor, the property should not be worked, until the whole of the money is available. But this is not always possible, and I hold that one is justified in taking some risk in this direction. Again, it is necessary to consider the capitalist. The mining engineer cannot always obtain the working capital, save on terms that largely diminish the value of the property to the public, and from the dividend-paying standpoint.

The true prospector is a man who "dreams dreams" (he would not be any good if he did not), and who endures untold privations and hardships, anticipating that one day he will realize wealth beyond his wildest hopes. The prospector may be excused taking a too sanguine view when he has discovered something; but if a man styling himself "a mining engineer" wilfully misleads himself and others into believing that a mere "prospect" is a mine, it should not be possible for that man to retain the title which he has so improperly assumed.

Being of too sanguine a nature or too inexperienced in the chances of mining, may lead to large and useless expenditure and loss. The difficulty of spending money, so that the data developed by that expenditure, are going to prove that the money itself has been judiciously spent, and has led to the justification of raising further capital or otherwise, demands from the advising mining engineer, the exercise of his greatest skill. On the one hand, he has to get the information for the least expenditure; and, on the other, to so arrange that, in the event of the property proving all he hopes or more, his previous expenditure can still be further utilized. At one time he may have to restrain or at another time encourage, those with whom he is associated, and who may not be equipped with his technical knowledge and experience.

To curb one's own hopes, to proceed with deliberate caution, and not to lose valuable time, often requires that the mind shall have been educated, by experiencing the bitterness of disappointment. From the prospecting up to the final stage, that of actually working the property so as to get the largest amount of profit in the shortest possible time, we have the dependence of mining upon capital, and it is considerations such as these that demand the gravest thought from those who propose to legislate for members of our profession.

We all know instances where a man with little professional training, and with the merest superficial experience, has posed as a mining engineer; I ask, can we wonder that our profession is, in many instances, regarded by a large section of the public as being of little or no repute? That this view is no new thing, is evidenced by the fact that the mining engineer was long ago called upon to verify his report by affidavit.

We want to consider the qualifications of the mining engineer and metallurgist, and how best the status of the members of our profession can be advanced. We want when it is said of a man "he is a mining engineer," that all may know, he is a man, who, in connection with mining enterprises, can be trusted with the expenditure of other people's money, or who may equally be trusted to save it, and who for undergoing the necessary training and acquiring that special knowledge and experience which enables him to overcome the difficulties which beset mining enterprises, is entitled to be equitably remunerated. It must always be remembered that metal mines are, generally speaking, short-lived. Either the deposit itself be-

*Excerpts from the Presidential address, Institution of Mining and Metallurgy, March 13, 1913.

comes worked out, or the economic conditions which at one time permitted profits no longer continue. The market price of all metals (if we except gold) is liable to such fluctuations that the substantial profits at one period become certain losses at another, and we have also our own particular risks, some preventable, and others non-preventable. I mean disasters due to underground fires, floods at surface or underground, falls of ground, air blasts, etc.

It is our present misfortune, and it will be our fault, if such conditions with regard to the lack of control which we as an institution have over those who call themselves "mining engineers" be allowed to continue. I hold no one should be permitted to style himself a mining engineer, or to practise as such, unless he is qualified to do so; and of his qualifications for mining, other than coal, this institution ought to be the tribunal.

From this point of view our position as an institution is not satisfactory. According to the law—important though we know ourselves to be, and as a fact are—we are not recognized as existing. No other institution fills, or has attempted to fill, the place that we occupy. We cannot, in the quaint wording of the Physicians' Charter, "Plead or be impleaded." We have no authority, jurisdiction or corporate being whatsoever. Anyone can call himself "a mining engineer," can re-date and use a report years after it was originally made, can write a report on a property that he never visits, or if he does so, it may be when the underground workings are inaccessible, can knavishly mislead the public with impunity; and all we can do, if he uses our initials, is to ask him to cease doing so.

In this connection, I very much like the phrase employed by the Royal Institute of British Architects, with regard to members of that profession, and I trust the mining engineer (when the use of that title is legally restricted) will always be regarded not only as the agent of a client, but also that such implicit confidence will exist, as to enable him to become a "friend and adviser." What we wish to do is, to protect the public on the one hand, and, on the other, secure an honourable career for ourselves.

**BEDFORD McNEILL**
**President, Institution of Mining and Metallurgy**

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# MAGMATIC ORIGIN OF SUDBURY NICKEL-COPPER DEPOSITS

Numerous descriptions of the Sudbury nickel-copper deposits have been published and many geologists have discussed the origin of the ore bodies. Most of those who are familiar with the district believe that the ores originated in the same magma as the norite with which they are associated. Some believe that the metallic sulphides were concentrated from the molten magma by differentiation during or preceding crystallization. Others believe the sulphides to be essentially secondary deposits made by aqueous solutions which may or may not have been derived from the magma.

The writer's purpose here is not to sum up the evidence in favour of each of these views, but rather to call attention to some of the processes involved in the solidification of the nickel-bearing eruptive; to state certain peculiar relationships which Mr. David H. Browne has found to exist between the ore deposits and the furnace products; to give Mr. Browne's interpretation of these relationships and to show how these facts and the interpretation of them are in accord with the theory or origin.

That the formation of the ore bodies was primarily by differentiation is here assumed. It is not denied that there is abundant evidence of secondary deposition, for in some of the deposits there are relationships which can only be thus interpreted. After examining a few of the deposits and studying the literature, especially the work of Prof. Coleman, it seems clear to the writer that the localization of the ore bodies has resulted from a directly igneous process of concentra-

(1) Dr. A. E. Barlow and Dr. A. P. Coleman have reported on the district for the Geological Survey and the Ontario Bureau of Mines, respectively. They both believe that the ore bodies were formed by a process of magmatic segregation. Dr. C. W. Dickson has presented the evidence in favor of secondary origin in Transactions of A. I. M. E. Vol. XXXIV. 1904, pp. 3-67. Prof. T. L. Walker discussed differentiation in the nickel-bearing eruptive in Quart. Jour. Geol. Soc. Vol. LIII., No. 209, 1897, pp. 40-65. References to writings of several others are to be found in these reports and papers. An extensive bibliography accompanies Dr. Dickson's paper.

A paper presented by R. E. Hore at Annual Meeting Canadian Mining Institute, Ottawa, March, 1913.

tion, and that this is therefore the theory of origin most useful in directing exploration. Individual ore deposits often show sulphides in the form of fillings in the norite and sometimes secondary silicates occur with the sulphides. Such ore may very well have been derived without great migration of the constituents, from primary ore bodies. It would be remarkable if secondary changes had not taken place in these old deposits, especially in places where crushing and faulting (2) has occurred. Without further reference to such changes, however, let us consider the primary separation of the sulphides from the molten magma.

From Prof. Coleman's descriptions of the fused character of the conglomerate immediately overlying the eruptive sheet, with which the ores are associated, it is evident that when the magma had pushed its way out along the unconformable contact, it was still at a temperature much above that of its freezing point. It doubtless absorbed a very large amount of the conglomerate, and it is likely that the light coloured siliceous upper part of the eruptive is due largely to such absorption. The extension of the norite far out from the main mass into comparatively narrow crevices in the surrounding rocks points also to very considerable superheating. It seems likely that enormous quantities of heat were given off before any appreciable portion of the magma had cooled to a temperature at which solidification began. There was then this very thick molten bed with its thin solid crust surrounded by rocks that were already highly heated. Further loss of heat must have been at a very slow rate, and the time for differentiation in situ was undoubtedly enormously long.

So far as known molten silicates are miscible in all proportions. Molten sulphides, however, will not mix in all proportions with molten silicates. One cannot state off hand, therefore, whether the cooling magma would behave as one or as two or more solutions. From a consideration of the end products—the norite and ore bodies—it seems to the writer (3) that before solidification took place the magma with decrease in temperature had separated very imperfectly into two solutions. One of these was composed chiefly of the constituents of silicates and the other chiefly of the constituents of sulphides. Each solution contained a comparatively small portion of the constituents of the other. The sulphide solution being heavier sank to the bottom. The process would be much like the separation of matte from slag, with the very essential difference that none of the furnace man's precautions to effect a clean separation were taken. The proportions of the constituents not being the most favourable and no fluxes being added, the resulting solid does not show two distinctly separated portions. Not only was the boundary irregularly defined, but one solution in solidifying may have enclosed numerous detached portions of the other.

In each solution, moreover, there would be further differentiation as the necessary result of the fact that some minerals crystallize before the others. The first minerals formed would be found at the margins. On these more crystals of the same composition would form, and the composition of the remaining solution be thereby changed. Moreover, crystals forming early in any part of the solution, if of high specific gravity, would sink slowly. Since, however, at the temperature at which such crystals separate out the melt would be very viscous, the sinking of crystals would be extremely slow. Some differentiation from these causes alone would, however, without doubt take place.

If the proportions of sulphides and silicates were such that their molten constituents were perfectly miscible under the conditions and no separation in the liquid state took place, there would certainly be some accumulation of sulphides in the lower part as the result of the crystallization phenomena just mentioned. One may well doubt, however, whether the ore deposits were thus produced. It is true that all gradations from solid ore to norite containing only a few scattered grains of sulphides occur; but compared with the thickness of the sheet the transition takes places in a remarkably short distance. Incomplete miscibility of the constituents of the magma and consequent formation of two solutions would be much more likely to result in the formation of such deposits. Imperfect separation of the two solutions with resulting entanglement of large and small bodies of the other during the solidification would explain the absence of a sharp line of division comparable with that obtained in furnace practice. Moreover, each solution contained some of the constituents of the other. Thus the silicate solution was saturated with sulphides, and on cooling below the temperature beginning the freezing interval, it is probable that the sulphides would be among the first formed minerals. If in the silicate solution there were any included bodies of the sulphide solution, there would be doubtless a change in the composition of the solutions in contact. After the main mass of the silicate solution became solid there would on further cooling be a second deposition of sulphides from the included solution. We would expect as a result of such processes to find, and we do find, large masses of norite specked with grains of early formed sulphides and with occasional patches of later formed massive sulphides, and from the sulphide solution massive ore with early formed silicates enclosed in it.

### David H. Browne's Comparison of the Ore Bodies With Furnace Products Obtained in Treating the Ores.

In the light of the theory that the ore bodies have been formed by a process of magmatic segregation as above outlined, it is interesting to compare the ore bodies with the furnace products. That the comparison is an apt one has been shown by Mr. David H. Browne in a paper entitled, "Segregation in ores and mattes," published in School of Mines Quarterly, July, 1895. Mr. Browne shows in his paper that the distribution of copper and nickel in the matte is closely analagous to the distribution of the two metals in the ore bodies, and he has kindly supplied the writer with data which clearly substantiate his argument. In his paper, Mr. Browne gives the results obtained by careful analysis of copper-nickel matte made in water-jacketed blast furnaces from roasted copper-nickel ore. This matte, having an average composition Cu. 24, Ni 20, Fe 28 and S 28%, was tapped into hemispherical or conical cast-iron pots, allowed to set and turned out on the dump to cool. The moulds or matte pots used were about 24 in. in diameter by 14 in. deep. The matte was tested to determine variations in composition at different parts.

"Numerous analyses showed that in one and the same matte casting a sample broken from the top will be, as a rule, higher in copper and lower in nickel than a sample from the bottom. Eleven pots thus examined gave an average as follows:

(2) The existence of a great fault at the Crean Hill Mine is pointed out by Dr. Coleman in his recent report to the Department of Mines. Summary report 1911, pp. 87-89.

(3) For previous views and further references on this subject see "On the Igneous Origin of Certain Ore Deposits" by F. D. Adams, Journ. Gen. Min. Ass. of P. Q., Vol. II., p. 35. 1894.

| | Cu. | Ni |
|---|---|---|
| 11 top samples ........ | 23.26 | 20.15 |
| 11 bottom samples...... | 21.14 | 20.32 |
| | 2.12 | 0.17 |

"Further analyses showed that nickel was higher at the centre than at the bottom of the casting. Copper tends towards the top and outside of the casting, while nickel and iron tend to concentrate toward the centre."

Mr. Browne gives the following figures obtained from analyses of samples taken along central horizontal plane of a pot.

| | Outside. | —— | —— | Centre. |
|---|---|---|---|---|
| Cu ....... | 25.12 | 24.30 | 21.06 | 19.02 |
| Ni ....... | 22.82 | 23.80 | 25.04 | 29.24 |
| Fe ....... | 26.5 | 26.6 | 26.8 | 27.00 |

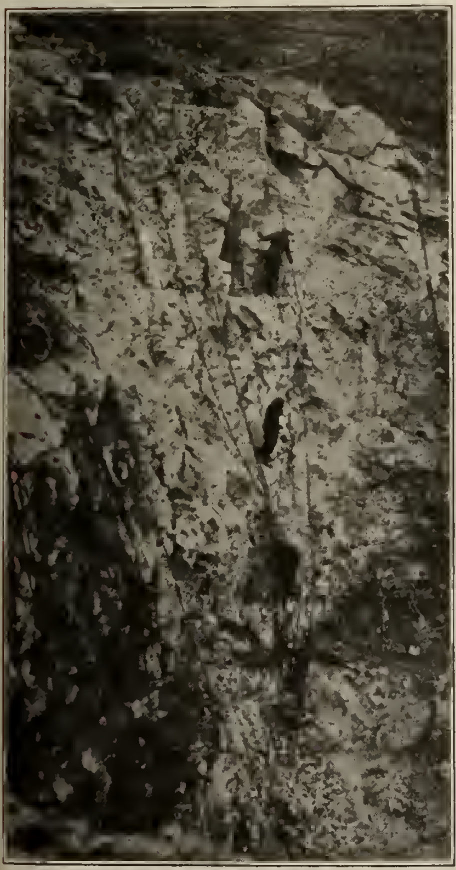
and the following figures for section along vertical central lines of a pot of furnace matte:

| | Cu. | Ni. | Fe. |
|---|---|---|---|
| Top ..... ..... | 27.36 | 22.46 | 24 0 |
| | 26.14 | 22.94 | 25.0 |
| | 19.02 | 24.24 | 27.0 |
| Centre.................... | | | |
| | 19.6 | 27.0 | 28.1 |
| | 21.8 | 24.94 | 28.3 |
| Bottom .... ..... | 24.12 | 22.46 | 28.0 |

The analyses showed that the segregation of the nickel to the centre and the dispersion of copper to the outside is very pronounced. From other observations and experiments the same conclusion was drawn.

Mr. Browne also calls attention to the fact that sodium sulphide forms with the matte an exceedingly fluid magma from which on cooling nickel sulphide separates as a bottom. He concludes that "if copper-nickel-iron sulphides can be held in a molten condition the copper and nickel will separate as individual minerals, the sharpness of the separation being dependent on the fluidity of the mass and the time occupied in cooling."

Considering then the ore deposits, Mr. Browne states, "The tendency of copper pyrites to separate from the nickeliferous pyrrhotite is very noticeable. However closely the two minerals may be intermingled, each is entirely free from traces of the other. The chalcopyrite is free from nickel, while the pyrrhotite beside it is free from copper. Beside this chemical separation there is an equally noticeable physical separation. It may be stated, as a rule, that copper tends toward the rock, whether forming the wall or forming included masses. The miners often remark the way in which copper follows the rock, and look on the presence of massive copper ore as indicating an approach to the rock. In driving a drift from the shaft in clean norite to and through the ore, the first symptoms of the presence of the ore are small shots or pockets of copper pyrites impregnating the rock. Coming nearer to the ore-body the amount of copper increases, large masses being met with before any nickel is found. On reaching the ore proper, the copper pyrites is found mixed with pyrrhotite and rock, while



West end, open pit

East end, open pit, Creighton nickel-copper mine

"In order to get a correct sample and to map out, if possible, the variations of copper and nickel, a quarter pot was placed under a drill and sampled by drilling with an inch drill holes one-half inch deep at the points marked. These samples were analyzed and the entire quarter pot was now crushed, quartered, sampled and analyzed. It contained Cu 24.64, Ni 22.86, Fe 26.70 and S 25.82."

in the heart of a deposit a large quantity of nearly pure pyrrhotite (and pentlandite) almost free from copper is found. The cross-section of the ore-body then shows as follows: rock, copper-ore and rock, copper-nickel ore, nickel ore, copper-nickel ore, copper ore and rock, and finally rock again."

"The ore as mined does not show these variations for there is much ore intermixed with the rock walls and many included fragments of rock in the ore-body itself, and each mass of rock tends to attract copper ore."

"A general tendency of copper to disperse to the rock and to the walls and of nickel to concentrate towards the centre of the deposit, is thus shown to exist in the ore-body."

Mr. Browne further showed by analyses of ores from different depths at the Copper Cliff mine that the nickel sulphide is more perfectly separated as depth increases. This is true also of mattes.

In mining the ore there is necessarily broken a considerable percentage of rock. In the rock houses the ore is crushed and then hand-picked on travelling belts. Both ore and rock are regularly sampled and analyzed. There is kept, therefore, a complete record of the contents of all ore and rock that is mined. A consideration of the following figures, calculated by Mr. Browne from the average analysis for each year's output, will show clearly that the ratio of copper to nickel is much higher in the rock than in the ore. With Mr. Browne's figures I will quote the interpretation of them as he has presented it to me.

**Ratio of Copper to Nickel in Ore and in Rock.**

| Creighton Mine. | Parts Nickel | Parts Copper in ore. | Parts Copper in rock. |
|---|---|---|---|
| 1909 | 100 | 35 | 87 |
| 1910 | 100 | 36 | 75 |
| 1911 | 100 | 38 | 88 |
| Average | 100 | 36.3 | 83.3 |
| No. 2 Mine | | | |
| 1910 | 100 | 61 | 141 |
| 1911 | 100 | 54 | 147 |
| Average | 100 | 57.5 | 144 |

"Averaging these results we find that for each 100 pounds nickel in ore there was at Creighton 36.3 and at No. 2 mine 57.5 pounds copper, and that for each 100 pounds nickel in the rock there was at Creighton 83.3 and at No. 2 mine 144 pounds copper.

"The ratio of relation of the nickel and copper in ore to the nickel and copper in rock is as follows:

"This means that the copper relation in Creighton rock is 2.3 times the copper relation in the Creighton ore.

"This ratio represents the average of a very large tonnage—in the case of Creighton mine several hundred thousand tons. Ore and rock from other mines show similar ratio of copper to nickel, and we can now make more emphatically the statement that the ratio of copper to nickel in the rock is very considerably greater than the ratio of copper to nickel in the ore. In matte similar relations were seen in comparing the margins with the centre.

"An analogy between ore body and matte along a horizontal line being thus established, we have now to consider the variations along a vertical line. If there is an analogy here we would expect to find the ratio of nickel to copper increase with depth until a point well down towards the bottom is reached. As the various workings in the mines are not separately sampled, we have no assay plan showing the required figures. We have, however, the analyses of regularly taken samples of ore mined and as, in general, each year sees ore taken from lower levels than the previous year, we have figures showing changes in ratios with increase in depth. In some mines, such as at Creighton, where ore is being still taken from various depths from surface to the fourth level, the yearly averages do not give much clue to changes with depth. At other and smaller ore bodies, where sinking was fairly regular, we find a very significant series of figures. These show clearly that with increase in depth in the ore there was an increase in the ratio of nickel to copper.

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**Increase in Ratio of Nickel to Copper With Increase in Depth as Shown by Average Analyses of each Year's Production.**

| Year. | Parts copper to 100 parts nickel. | Remarks. |
|---|---|---|
| No. 2 Mine. | | |
| 1898 | 74 | Gophering on surface. |
| 1899 | 121 | |
| 1900 | 77 | |
| 1901 | 79 | |
| 1902 | 90 | Going down |
| 1903 | 62 | |
| 1904 | 49 | fairly |
| 1905 | 53 | |
| 1906 | 44 | uniformly. |
| 1907 | 49 | |
| 1908 | | Not worked. |
| 1909 | | Not worked. |
| 1910 | 61 | Taking out floors and pillars. |
| 1911 | 54 | |
| Evans Mine. | | |
| 1890 | 85 | |
| 1891 | 57 | |
| 1892 | 56 | Widening on pit. |
| 1893 | 92 | |
| 1894 | 117 | |
| 1895-96 | 94 | |
| 1897-98 | 98 | Going down. |
| 1899 | 87 | |
| Stobie Mine. | | |
| 1890 | 113 | |
| 1891 | 93 | Widening on pit. |
| 1892 | 94 | |
| 1894 | 73 | |
| 1895 | 104 | |
| 1896 | 89 | |
| 1897 | 87 | |
| 1898 | 86 | Going down. |
| 1899 | 64 | |
| 1900 | 44 | |
| Copper Cliff Mine. | | |
| 1888 | 200 | |
| 1889 | 147 | |
| 1890 | 156 | |
| 1891 | 87 | |
| 1892 | 125 | |
| 1893 | 118 | |
| 1894 | 108 | |
| 1895 | 80 | |
| 1896 | 135 | |
| 1897 | 157 | A second ore shoot. |
| 1898 | 93 | |
| 1899 | 137 | Robbing pillars. |
| 1900 | 150 | |

"These figures, while showing many irregularities, prove the statement that the ratio of nickel to copper increases with depth. Many of the apparent irregularities are in reality not evidence of exceptions to this statement. The first few years output in several cases does not represent increase in depth alone, being offset by horizontal extensions of the pits. The last two years at No. 2 mine and Copper Cliff show reversal to higher copper ratio corresponding to robbing of pillars. Regular decrease in copper ratio is very noticeable in the figures for No. 2 mine for years 1899 to 1907, and the production for these years was from fairly regular increase in depth on a clean uniform chimney of ore. The figures for the Copper Cliff mine show a fairly regular decrease in copper ratio down to 1895, and then a much higher copper ratio in the succeeding years, were found on inquiry to correspond with the working out of one ore shoot and the development of a second deeper shoot."

"Another analogy between ore deposits and the furnace products is found in comparing the ratio of nickel to copper in slags with the ratio between these metals in the mattes. Small drops of sulphide are carried off by the slag, and analyses show the ratio of copper to nickel in slag to be always greater than the ratio of copper to nickel in the corresponding matte.

"Ratios of copper to nickel in matte and in slag:

| Year. | Parts copper to 100 parts nickel. In matte. | In slag. |
|---|---|---|
| 1910 | 44.3 | 47.5 |
| 1911 | 43.9 | 53.0 |

"An objection to comparison of these furnace products with the ore deposits lies in the fact that the iron has been oxidized and all put into this slag, while in the ore body it remains with the other sulphides. A better comparison would be obtained from products obtained on melting together rock and ore without oxidation. This is not a common practice, but has been done, and the resulting slag showed a copper ratio of 41.5 compared with a ratio of 32.8 in the matte.

"Interesting also are comparisons between the ratio of nickel to copper in marginal and in offset deposits. If the analogy between furnace products and ore bodies still holds we would expect to find in the offset deposits, where the molten magma penetrated far out into the surrounding rocks, that the ratio of copper and nickel is less than the marginal deposits. This is in fact the case. For the marginal deposits the only available figures showing the average for the whole output of the mine are for the Creighton. The figures given for the other properties are less truly representative. For the off shoot deposits the figures given are in each case the average for total output.

Ratios of copper to nickel in marginal and offset deposits:

| Marginal. | Parts copper for every 100 parts nickel. |
|---|---|
| Victoria mine | 87 |
| Gertrude mine | 50 |
| Creighton mine | 33 |
| Murray mine | 50 |
| Blezard mine | 50 |

Average for 5 marginal deposits, 54 parts copper to 100 nickel:

| Offsets. | |
|---|---|
| Evans | 88 |
| Cliff | 147 |
| No. 1 | 96 |
| No. 2 | 71 |
| Stobie | 74 |

Average for 5 offset deposits, 95 parts copper to 100 nickel.

## Summary.

1. It has been shown by Drs. A. P. Coleman, T. L. Walker, A. E. Barlow and others, that (a) the nickel-copper deposits of the Sudbury district all occur in the same type of rock—a quartz-hypershene-gabbro or norite.

(b) The norite forms the lower part of a great spoon shaped laccolitic sheet and the ore bodies occur along the lower outer margin of the sheet and in narrow masses of norite, which occur far out in the surrounding rocks.

(c) The ore bodies, sulphides of nickel, copper and iron have been formed by a process of magmatic segregation.

2. The author calls attention to the processes involved in the solidification of the magma and suggests that it is probable (a) that limited miscibility of the molten constituents of sulphides in the molten constituents of silicates resulted in the formation of two solutions—a silicate solution and a sulphide solution—each containing some of the constituents of the other.

(b) The sulphide solution sank to the bottom, but the separation was not a clean one, and on solidification a zone of intermediate composition was formed owing to inclusion of large and small bodies of one solution in the other. (In the furnace a cleaner separation is obtained by adding fluxes.)

(c) In each solution also differentiation took place by early formed minerals accumulating at the margins and especially at the bottom. Such differentiation was very incomplete owing to high viscosity at the freezing temperature.

3. Mr. D. H. Browne gives a statement of relationships between ore deposits and furnace products. He states that (a) "Analyses of a pot of matte show marked tendency of the nickel to accumulate in the central part, well towards the bottom. In the ore deposits a horizontal section shows increase in the ratio of nickel to copper towards the middle of the ore body. The output of mines shows an increase in the ratio with depth. The 'marginal' deposits show a greater ratio of nickel than do the 'offset' deposits."

(b) "Analyses of slag and matte show the ratio of nickel to copper to be greater in the matte than in the slag, and the same relation holds true for ore and the rock that is mined with the ore." One reason, doubtless, lies in the fact that molten nickel sulphide is more mobile than the copper sulphide, and that therefore a greater proportion of the former would settle out from the mixture. The relative solubility of the molten sulphides in the molten silicate solution is an unknown, but probably less important factor."

4. The analogies which Mr. Browne has shown to exist between the ore deposits and the furnace products strengthen the view that the deposits were formed directly from a molten magma.

5. Since the first solidification all the deposits have been altered—some slightly and others almost completely. The localization of the ore-bodies, however, was determined by the primary deposition, and this is, therefore, the factor of chief importance. The extent of secondary alteration has been peculiarly dependent on very local conditions, and the discussion of the nature of the secondary changes calls for more detailed description of individual ore bodies than is at present available.

# STOPING DRILLS AT SUDBURY, ONTARIO*

By Albert E. Hall.

In late years the stoping drill of the hammer type has been steadily improved, until now no mine manager can afford to overlook the possibility of using it as a means of reducing his working costs.

A stoper is cheaper to operate, since it can be handled by one man instead of two, as required on a large machine. In some cases a helper is assigned to two or three stopers, but, as a rule, this is not advisable. In addition, the use of stopers permits a larger proportion of the total time to be spent in actual drilling. With a big drill much time is consumed in setting up after a blast or after moving to a new working place; with a stoper, on the other hand, the preparations for drilling are simple. As a rule, a stoper can be rigged up and set to work 30 to 40 minutes earlier than a big drill. One disadvantage of the stoper, when used for shrinkage stoping, is its tendency to create a large amount of shattered and partly loosened rock on the roof and walls of the working place. The men must first scale of this loose ground, which takes from 30 minutes to an hour. With a sufficient number of working places, however, this scaling can be done by a special gang of scalers, while the machine men are drilling in a previously scaled place.

As a result of the extra time applicable to drilling, and also of the more rapid drilling, stopers make an average of 30 to 40 linear feet of hole per shift, while a large drill will make 20 to 30 feet. As a rule stopers work on a bench in the back. When necessary a bench is created by taking out a diamond cut, and is then followed across the stope. The holes are made about 6 feet deep. The amount of powder used (40 per cent. dynamite) as computed from several groups of holes average 0.63 lbs. per cubic yard of ore. The amount of air consumed by a stoper is estimated to be about two-thirds of that used by the largest drills.

Some workmen object to the stopers on the ground that stoppages for small repairs are too frequent. It is true that the dust, which is a disadvantage in itself, from the runner's standpoint, sometimes clogs the valve and prevents the extension leg or standard from working properly, but only a few minutes are needed to clean out the valve, and if a screen or a bit of waste be put into the hose, this trouble is almost eliminated. Water sprays can also be used. On the basis of total repair bills, the stopers do not compare unfavourably with the larger machines.

In many places it is impracticable to use a stoper, and a big drill becomes necessary; for example, in hard rock, where the light drill makes little or no headway; but in shrinkage stoping the smaller machine does excellent work. The stoper has one advantage, which is probably realized fully only by the men working underground; this relates to the matter of block-holing. Where the muck is being drawn off through chutes, the size must be fairly small, so as not to block the chute and so hinder tramming and hoisting. With small stoping drills, the ground is generally broken small enough to pass readily through chutes, and very little block-holing is required. With large machines, on the other hand, considerable block-holing is necessary.

*A paper presented at Houghton meeting Lake Superior Mining Institute, August, 1912.

# SOME APPLICATIONS OF CONCRETE UNDERGROUND*

By H. T. Mercer, Painesdale, Mich.

The rapid growth in favor of concrete for certain classes of construction has been one of the most noteworthy engineering developments of late years; and in this the applications made to the mining field have played an important part. This is owing to the decreasing supply of suitable timber and to the limited life of even the best timber when exposed to underground conditions.

Concrete has been used for many years in building underground dams, bulkheads, etc., some notable examples of which can be seen at the Chapin Iron mine at Iron Mountain, Mich. The principal uses of concrete in mines, however, is in connection with shaft support, and it is the purpose of this paper to describe some of the work that has been done along these lines in the Michigan Copper Country. Good examples of concrete shaft collars can be seen at many of the mines, and although the details vary somewhat, a description of one or two will perhaps suffice to illustrate this form of construction.

At the Trimountain mine it was decided to replace the old timber collars with concrete, and work was begun at No. 2 shaft, where the overburden was 80 feet deep, consisting for the most part of sand, with more or less clay and some boulders. To guard against any possible "running" of the sand, and to make the operation of the shaft during construction easier, as well as to reinforce the concrete, it was decided to replace the timber with steel I beam sets, and then concrete between and around the steel sets. The sets would provide a support in case it became necessary to put in lagging to hold back the sand before the concrete was placed. A foundation was first prepared at the ledge by placing heavy steeel beam box girders across the shaft from foot to hanging under the dividers and under the south e—nd plate (Fig. 1A). At the north end there was a natural rock ledge or shelf. Starting from the foundation thus formed the steel sets were built up, two or three at a time, and concreted in. The work proceeded as follows:

First, the old timber on the ends and footwall was taken out for as great a height as was deemed safe; then two or three of the steel sets were placed and bolted up, after which the forms were erected, and the concrete poured. Then another space would be opened up and the operation repeated, and so on until the surface was reached. Fortunately the old hanging wall plates did not have to be removed, as there was sufficient clearance to permit the new concrete lining being carried inside of them. Care was taken to leave no timber or blocking under the foot wall side of the concrete lining which might by rotting permit settling.

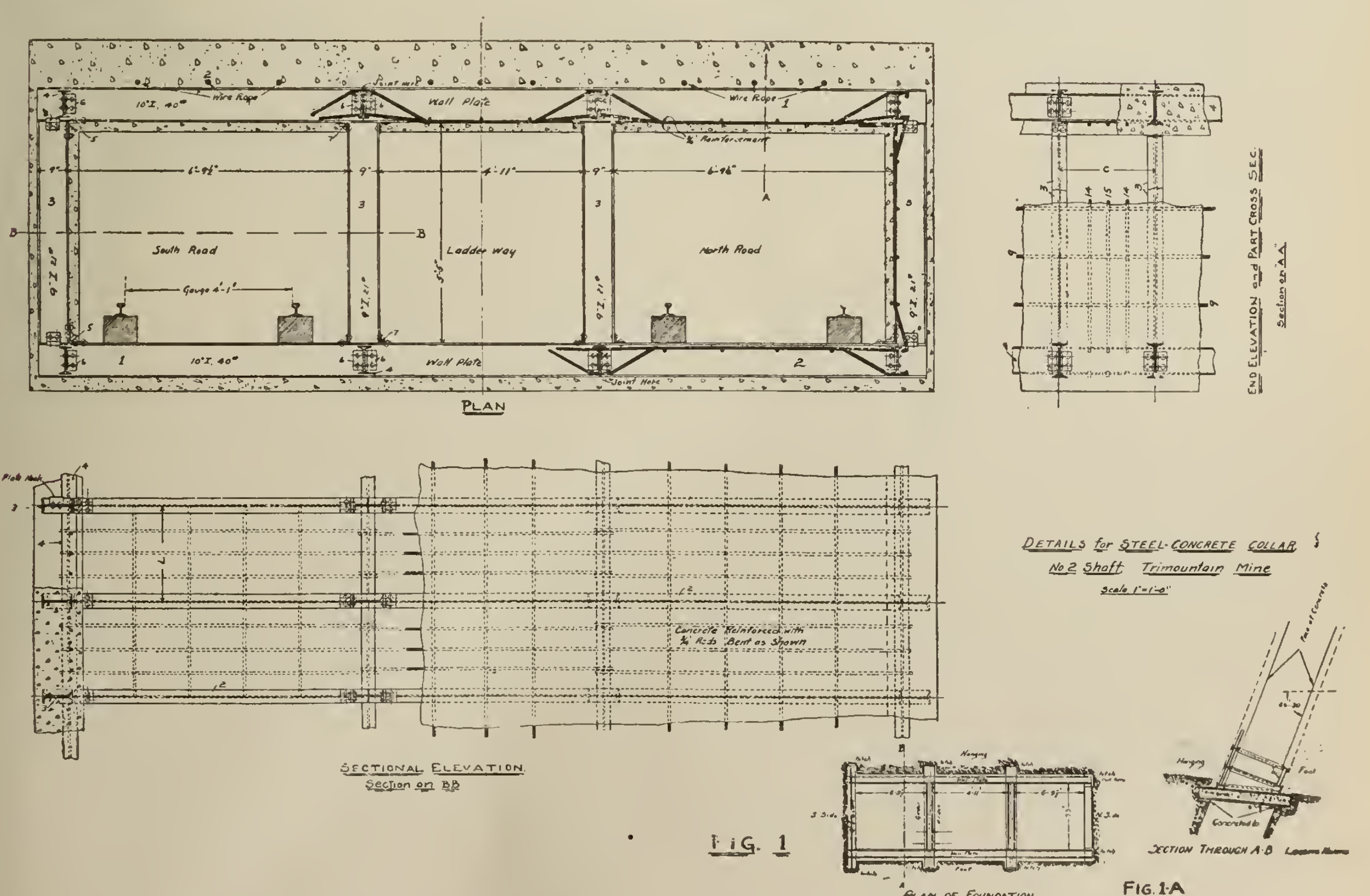
*From School of Mines Quarterly, July, 1913.

The sand was carefully tamped along the foot wall as the concrete was finished. One skip road and the ladder way were built first, hoisting going on meanwhile in the other compartment. The skip was then changed over to the completed road, and the other road was built up. The steel sets were 2 feet 4 inches apart in the lower half of the collar, and 3 feet 0 inches apart in the upper half, centre to centre. The concrete between the sets was reinforced with ¾ inch rods, as shown by Fig 1, which also shows the construction of the steel sets and the position of the concrete.

The materials used for the concrete were: Portland cement, coarse amygdaloid stamp sand and crushed trap rock. They were mixed by hand in the proportion 1:3:5, in the shaft house just back of the shaft and lowered by means of a bucket and trolley, the trolley rope being concreted in on the hanging side as the work progressed. As no difficulty was experienced at No. 2 shaft with the sand running in, or otherwise, it was decided to build the Nos. 3 and 4 collars of reinforced concrete only, leaving out the steel sets. Fig. 3 shows the construction of the No. 3 collar, which was started in June, 1910, and finished in August, 1910. The materials for the concrete were the same and the work was carried on in the same manner as at No. 2, except that there were no steel sets. The collar at No. 4 shaft was similar to the one at No. 3, except that the dividers were made 12x48 inches instead of 12x12 inches. The overburden at No. 4 shaft was 128 feet deep on the pitch of the shaft, (71 deg.), that at Nos. 3 and 2 being 60 and 80 feet, respectively; but in order to secure a suitable foundation, the No. 3 and No. 4 collars were started some distance below the ledge in the solid rock. The length of No. 3 collar was 93 feet, and No. 4 was 158 feet.

**Comparative Statement of Cost of Concrete Shaft Collars**

| | No. 2 Shaft. | No. 3 Shaft. | No. 4 Shaft. |
|---|---|---|---|
| Labor— | | | |
| Length to foundation.. | 80 ft. | 93 ft. | 158 ft. |
| Shaftmen ........ ... | $2,019.10 | $1,028.85 | $1,994.70 |
| Masons .............. | 528.51 | | |
| Surface labor ......... | 301.80 | 295.50 | 192.45 |
| Blacksmith labor ...... | 360.41 | 67.55 | 40.50 |
| Machinist labor ........ | 311.76 | 41.82 | 27.85 |
| Carpenter labor ....... | 144.97 | 42.73 | 54.69 |
| Electrician labor ...... | 10.84 | 8.82 | 8.96 |
| Teaming labor ........ | 120.56 | 74.46 | 56.64 |
| | $3,797.95 | $1,559.73 | $2,375.79 |
| Supplies— | | | |
| Structural steel ....... | $2,180.56 | | $ 136.00 |
| Cement—1252 sks. No. 2 ......... ..... | 588.83 | | |
| Cement—1238 sks. No. 3 ....... ........ | | $ 470.80 | |
| Cement—2169 sks. No. 4 ................. | | 810.09 | |
| Stamp sand—11 cars No. 2 .... ....... | 159.50 | | |
| Stamp sand—3¼ cars No. 3 | | 45.70 | |
| Stamp sand—8½ cars No. 4 ..... ...... | | | 123.25 |
| Fine rock, 6 cars ..... | 90.00 | | |
| Sundry supplies ...... | 261.75 | 102.55 | 75.91 |
| Freight ..... ...... | 215.33 | | |
| | $3,495.97 | $ 619.05 | $1,145.25 |
| Total cost of shaft collars ......... | $7,293.92 | $2,178.78 | $3,521.04 |




**Details for steel-concrete collar, No. 2 shaft, Trimountain mine**

No. 2 Shaft Collar commenced February, 1907, completed August 1907.

No. 3 Shaft Collar commenced June, 1910, completed August, 1910.

No. 4 Shaft Collar commenced March, 1911, completed August, 1911.

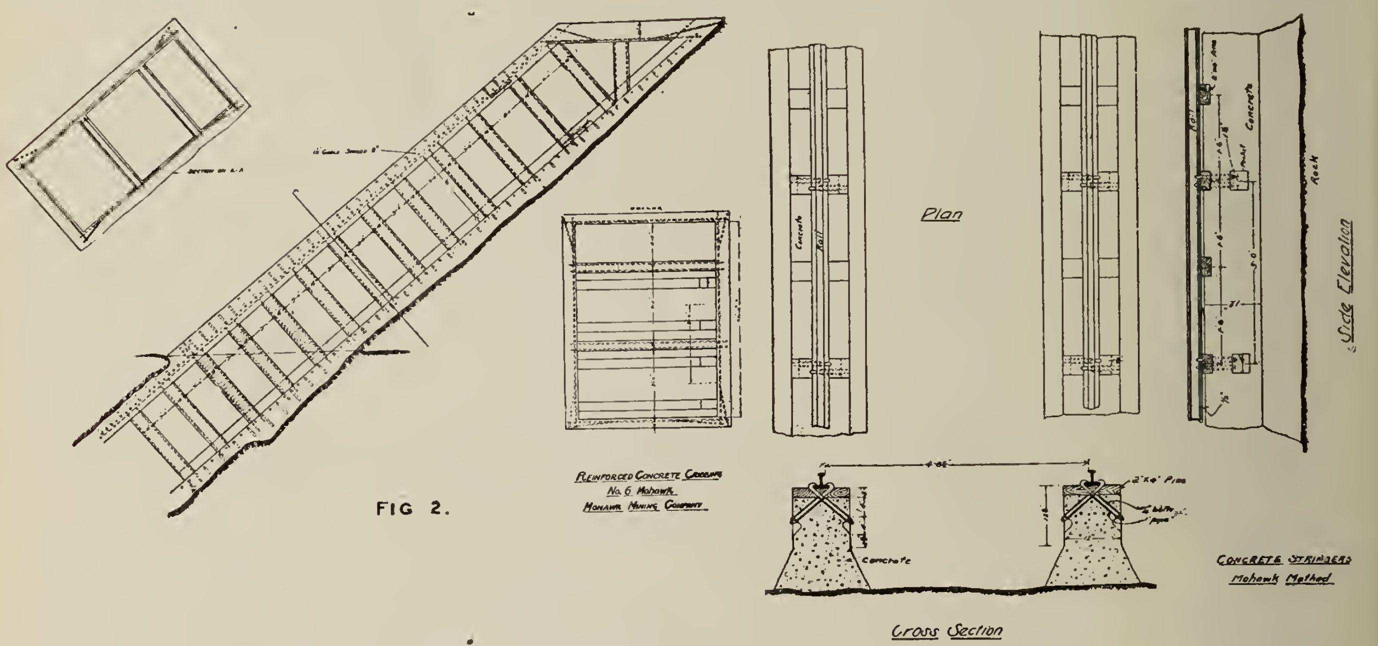
| Cost per Foot— | Labor. | Supplies | Total. |
|---|---|---|---|
| No. 2 shaft ......... | $47.47 | $43.70 | $91.17 |
| No. 3 shaft ......... | 16.77 | 16.66 | 33.43 |
| No. 4 shaft ......... | 15.04 | 7.25 | 22.29 |

Fig. 2 illustrates a reinforced concrete collar designed by Mr. W. F. Hartman for No. 6 shaft, Mohawk mine, where the dip is very flat (about 38 deg.). The reinforcement was rods and wire rope. The collar was built in 17 days and the total cost was $3,931.00. The length of the collar was 100 feet. The pit was first excavated at the shaft site. Then the forms were started at the bottom and built up as the work progressed. The concrete was mixed on surface and run down to the working platform in an iron trough. The use of concrete for plat floors, levelers, stringers and dividers is becoming quite common.

put in, reinforced with old rails and wire rope. The concrete extended across the hanging and down on both ends, and sometimes across the foot, and there were also heavy concrete dividers 4 feet high by 10 in. thick, placed 10 or 12 feet apart. At several levels the whole plat was arched over with reinforced concrete. This lining has been in place about two years and has proven satisfactory.

Drift sets built of concrete have been tried to some extent at the Wolverine and Mohawk mines in some of their cross-cuts, where loose ground was encountered. These sets consisted of legs 6x6 inches in section, and a cap 6x8 inches, reinforced with ½ inch rods and wire rope. Concrete planks, reinforced with Kahn expanded metal, or woven wire, were used for lagging. Above the caps they were 4x14 inches in section and behind the legs 2½x14 inches.

The use of reinforced concrete in the form of shaft sets and lagging is well described in a paper read before the Michigan College of Mines Club, at Houghton, Mich., by Mr. E. R. Jones, who has kindly given his permission for the use of the following excerpt:




**Concrete Stringers and reinforced concrete cribbing, Mohawk mine**

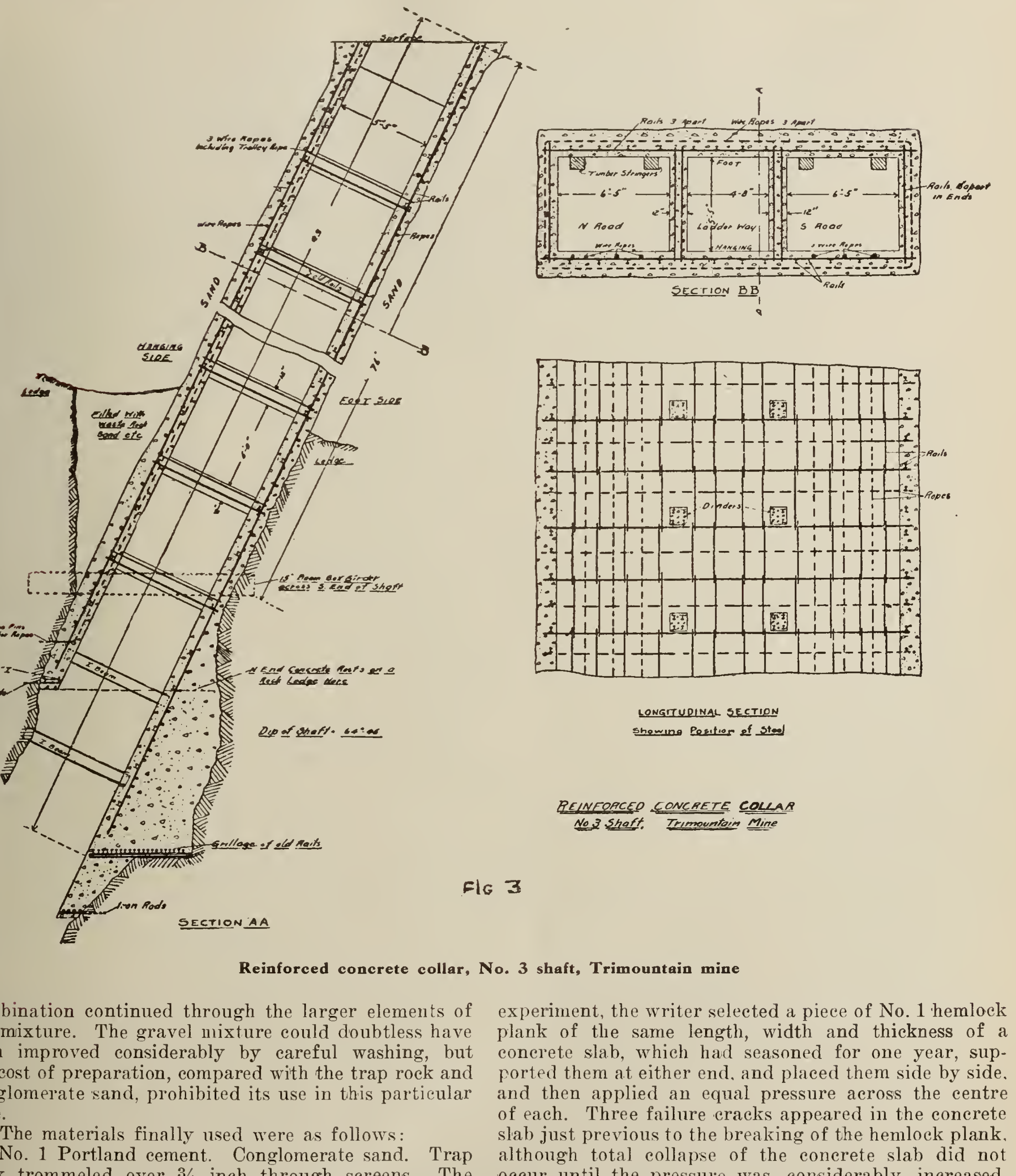
Fig. 4 shows a station or plat in one of the Champion Copper Company's shafts, and indicates the manner in which the levelers are reinforced. This illustration also shows the method used for concrete stringers. At first an all concrete stringer was built after the manner in use at Ahmeek mine, as designed by Mr. W. J. Uren, to which the rail was bolted by means of bolts and clips, but because of the hard rigid roadbed thus formed the wear and tear on skip and rails was very great, and the bolts and clips were continually working loose. The scheme was therefore abandoned in favor of a combination wood and concrete stringer.

Fig. 4 shows the method in use at the Copper Range Consolidated Company's mines, and the Mohawk and Wolverine scheme is illustrated in Fig. 6. Both methods made a very satisfactory roadbed.

At some of the mines where the foot is subject to "heaving" concrete stringers cannot be used advantageously.

In sinking through some loose ground at one of the Champion shafts it became necessary to close-timber, or line the shaft. Concrete 12 to 18 inches thick was

"For a number of years solid concrete and reinforced concrete shaft collars and shafts have been in vogue where the conditions warranted a shaft of any degree of permanence, but not until 1909 was reinforced concrete tried as a substitute to take the form and similar methods of installation as the long-used timber sets for shaft purposes; namely, at the Nos. 3 and 4 shafts of the Ahmeek Mining Company. At first, two distinct kinds of material were used; a good grade of gravel and natural sand from a local pit; and the trap rock, through which the shafts were sinking, together with clean conglomerate sand from the Calumet and Hecla mill. Sets were moulded from these two classes of material and installed with equal partiality and subsequent service has proven both to be equal to the demands made upon them. Pieces set aside for the purpose were allowed to season sufficiently that they might be given a fair competitive test, and it was found on comparing the fractures in the two combinations of material, that the sand and cement filling the spaces between the rounded pebbles broke away from them, while the fracture in the trap-conglomerate same




**Reinforced concrete collar, No. 3 shaft, Trimountain mine**

combination continued through the larger elements of the mixture. The gravel mixture could doubtless have been improved considerably by careful washing, but the cost of preparation, compared with the trap rock and conglomerate sand, prohibited its use in this particular case.

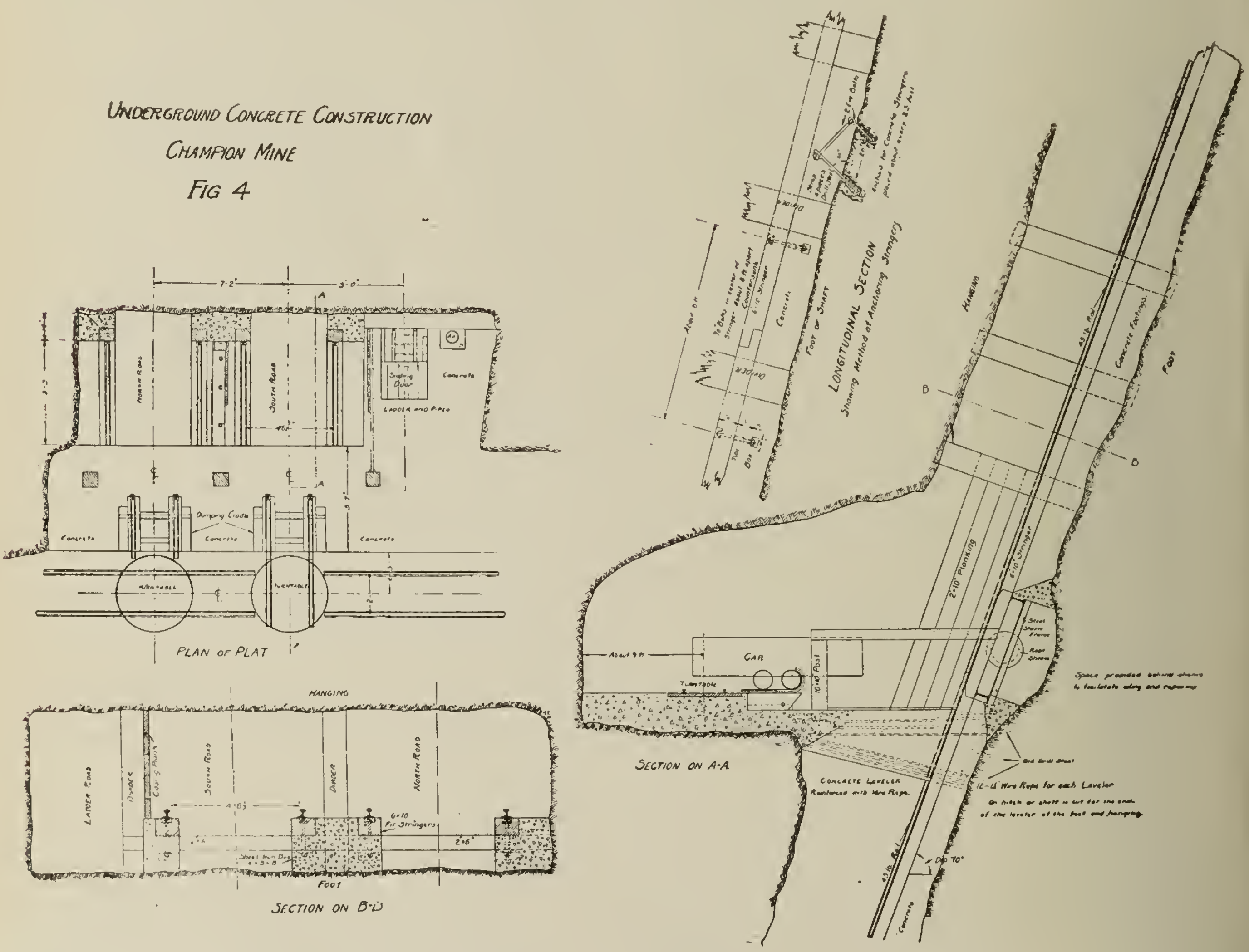
"The materials finally used were as follows:

"No. 1 Portland cement. Conglomerate sand. Trap rock trommeled over ¾ inch through screens. The proportions used were 1:3:5 in wall plates, end plates, and dividings, and 1:2:4 in studdles. The reinforcement in wall and end plates consisted of three ¾ inch monolith steel bars with ¼ inch webs, crimped onto them, together with two straight ¾ inch monolith bars. The dividings were reinforced by four ½ inch monolith steel bars wound spirally with ¼ inch steel wire, the whole presenting a column with square cross-section. Studdles were reinforced with two pieces of old wire rope 1¼ inch in diameter. Reinforced concrete slabs were moulded for the shaft lining, the material used being fines of trap rock under ¾ inch, conglomerate sand and Kahn expanded metal as reinforcement. The mixture used for slabs was 1:2:4. By way of experiment, the writer selected a piece of No. 1 hemlock plank of the same length, width and thickness of a concrete slab, which had seasoned for one year, supported them at either end, and placed them side by side, and then applied an equal pressure across the centre of each. Three failure cracks appeared in the concrete slab just previous to the breaking of the hemlock plank, although total collapse of the concrete slab did not occur until the pressure was considerably increased. While the method of the test employed was crude, it proved to the satisfaction of the writer that the concrete slab was much superior in strength. Considering the rapid decay of timber used as shaft lining no further comparison of the two is necessary.

"In the moulding of the concrete sets, 2 inch No. 1 white pine was used in the construction of the forms. These were soaked in Delaney's wood preservative, and repainted with preservative on the interior each time before setting up, thus insuring them against warping and prolonging their lives indefinitely, as well as securing a smooth and easy parting from the concrete when removed. A Smith barrel type mixer was employed in preparing the charge for the forms. The amount of water used in the mix was such that, when the batch was piled, it settled rapidly without agitation. A dryer mix was attempted by way of experiment, but due to the amount of reinforcement employed, it was found impossible to ram the dryer mix into place.

"The labor involved in making consisted of two carpenters, setting up forms and keeping them in repair; one man wheeling forms onto skidways ready for filling, returning used forms to shop and cleaning the same; one man feeding mixer from stock piles of rock, sand and cement; one man delivering mix to forms and shovelling material into place; and one mason ramming charge into final position. With this combination of men as many as four complete sets, consisting of 64 separate pieces, have been moulded in one day of nine hours. In ordinary weather, the sides of the forms were allowed to remain in position over night, and then removed, while the bottoms were left in place another 24 hours. The bottoms were removed by turning the pieces on their sides, where they were left to harden one day longer before removal to the stock pile. All through the process of removal the sets were handled with the greatest care in order to preserve the appearance of the set and prevent cracking, which might not develop to the eye until weathered. All skidways used in making and storing were brought to a level to prevent warping and bending while the sets were green, to insure a perfect fit underground, for, unlike timber, the concrete set cannot be brought to place unless perfectly true. Sets should not have been used under 60 days after removing forms, although we, through the reduction of the stock piles, have been forced to install pieces of 14 days set, but the greatest care was observed in handling and putting in place underground. Concrete sets one year old, which have been subjected to all manner of weather, can be abused somewhat and handled almost as carelessly as timber.

"As before stated, the above mentioned sets were made for the Nos. 3 and 4 shafts of the Ahmeek Mining Company. The shafts are of the three compartment variety—two skipways and one manway, dipping at an angle of 80 degrees. The outside dimensions of the compartments are:




**Sections and plan showing underground concrete construction, Champion mine**

"Skipways—7 feet 6 inches high, 6 feet 10 inches high.

"Manway—7 feet 6 inches high, 3 feet 0 inches wide, with the end plates and dividings, making the greatest span of 7 feet 6 inches. Offsets were moulded in all plates 5 inches from the inside face to accommodate lining slabs. Also, holes were cored for the use of hanging bolts and bracket bolts. The wall plates, end plates and studdles have a cross-section of 80 square inches, dividings 81 square inches. The percentages of reinforcement are approximately as follows:

| | |
|---|---|
| Wall and end plates | 5 per cent. |
| Dividings | 5 per cent. |
| Studdles | 3 per cent. |

"It was found advisable from the beginning, because of the great weight of the wall plates, to mould them in two sections, one section spanning the ladder way and one skipway, and the other section spanning the remaining skip compartment. These two sections were connected when in place by two bolts passing through holes, cored for the purpose, and two straps of iron spanning the splice. Studdles were made for 4 feet 0 inches, 5 feet 0 inches, and 6 feet 0 inches sets to accommodate the ground passed through.

"The weights of the different pieces comprising the set are as follows:

| | Pounds. |
|---|---|
| Long section of wall plate | 1,035 |
| Short section of wall plate | 700 |
| End plate | 600 |
| Divider | 645 |
| Three feet 3 inch studdles | 268 |
| Complete set of 16 pieces | 8,104 |

"Taking the weight of No. 1 Western fir, which has been exposed to the weather in stock piles, as 33 pounds per cubic feet, the above concrete set weighs almost three times that of a 12x12 inch timber set, which the concrete set is intended to replace. Because of this additional weight of the concrete set, it was found necessary to increase the usual five or six men on the timber gang to seven in number. In a vertical shaft, to which the concrete sets are especially adapted, the number of men per gang might again be reduced. The sets are hung or built as the ordinary timber sets, only requiring an additional rope and block to swing the pieces in place. After the sets are wedged to line, bottoms are put in between the plates and the surrounding shaft wall, and the set is then tied to the shaft wall by means of concrete, in the proportion of 1:3:5. The concrete slabs are then put in place, and loose rock thrown behind them, filling up what space still remains between the set and the wall of the shaft.

"After the set is in place, it is extremely important that it is well protected from the blast, for, unlike the timber set, concrete will not stand the blast. For the purpose, the writer used flat timber and steel plates chained to the under side of the plates and dividings, and even this precaution was at times inadequate. Where the ground was breaking easily, the sets have been as near as 12 feet to the miners, and again when the ground was especially refractory, sets 40 feet from the blast have been cut out. It is obvious that it is well to keep as far behind the mining as the ground will permit. In dangerous ground, which required timbering close up to the sinking, timber sets were used, but, had not time played an important part in the sinking, no ground was met in which concrete sets could not have been installed. With a gang of seven men, one complete set can be installed in a nine hour shift. This permits a sinking rate of better than one hundred feet per month, which was accomplished at the Nos. 3 and 4 shafts.

"The comparative cost of the concrete set and timber set, delivered at the shaft collar, is striking. The concrete set was delivered for $22.50, the timber set for $37.60. These figures are based on:

"Western fir at $28.00 per M., f.o.b. car.

"Crushed rock at 35c per yard, f.o.b. shaft

"Conglomerate sand at 60 per yard, f.o.b. shaft.

"No. 1 Portland cement at $1.15 per bbl., f.o.b. works.

"Reinforcement at $12.00 per set, f.o.b. factory.

"The Ahmeek Mining Company, I believe, was the first to adopt the concrete stringers, and the Mohawk Mining Company soon followed with their use. At the Ahmeek, these stringers have been in continuous use since the beginning of operations, and have required no repairs. Superintendent Smith of the Mohawk has informed me that soon after the stringers were installed, skip repairs increased about 100 per cent. The stringer being entirely rigid and the skip also of rigid construction, the axles of skips were found to be crystallized and the rivets working loose. This feature was overcome by moulding inch pine strips, after preserving them in Delaney's wood preservative to prevent decay, into the stringers at intervals of three feet, allowing them them to propect one-half inch above the face of the stringer, and resting the rail thereon. The pine strips have been in place four years, and none have been replaced to date, and skip repairs have been reduced to normal. Possibly because of a differently constructed skip, Ahmeek repairs were not abnormally high, but the same racking of the skip body occurred and the Ahmeek Company has adopted the Mohawk feature and expects to profit accordingly.

"Concrete plats, or stations, have been in use at both the Ahmeek and the Mohawk for some time. They differ from the timber plat in outward design only in the cross-section of the members, which are 9x12 inches, and are reinforced with old rail and wire rope, and replace the 12x12 inch and 12x14 inch timber formerly used. Holes are bored to accommodate gates for skip and dump doors, and tram rails are imbedded in the concrete, making the use of spikes unnecessary. When turn-tables are used on the back of the plat, the rigidness furnished by the concrete insures the trammers against derailed cars, resulting from a tilted table.

"At the present time our company is installing reinforced concrete dividings to replace the practice of putting in 10 inch flat timber. In cross-section they are 9x12 inches, and are reinforced by old rail. On the ladder road, they are placed six feet from centre to centre and between the skip compartments are put in as often as the hanging requires. Since the casing along the ladder road performs no other office than the protection of the men while on the ladder, or in case of a fall, plank is used for the purpose, and a 3-inch hemlock strip is moulded into the dividings to facilitate the fastening of this casing."

# SPECIAL CORRESPONDENCE

## PORCUPINE, SWASTIKA AND DANE

**The Bush Fires** which have caused so much uneasiness and loss of property, have subsided without much damage to the mining industry. The Cobalt camp is, of course, safe, and has been for several years past, owing to the very large area absolutely clear of all vegetation. In Porcupine there was some trepidation; but, thanks to the wholesale and very efficacious precautions taken after the lamentable fire of two years ago, there was no damage of any account done. At Kirkland Lake the bush is fairly green, and the wind shifted at a favourable moment. To sum up, the only loss was of several plants, isolated and long abandoned.

**A Copper Mine at Dane.**—There appears every possibility of the Temiskaming districts possessing a copper mine. In the first annual report just issued, Mr. G. O. McMurty, manager for the Dane Mining Company, estimates that in milling ore alone, they now have reserves which should yield a profit of over half a million dollars. The principal claims of the Dane Mining Company are about six miles from Dane, which is a station on the T. and N. O. Railway, fifty miles north of Cobalt. Before Cobalt was discovered, the Temiskaming and Hudson Bay Mining Company of New Liskeard sent prospectors north before they heard of the staking in Cobalt. These men stopped at Boston township, going up there by way of the Blanche River, before the steel was laid past New Liskeard. They staked what they described as iron deposits, but the claims were allowed to lapse when the tremendous excitement broke out at Cobalt. Some of these claims undoubtedly are the same as are now proving to be of value to the Dane Mining Company. After detailing the development to date, Mr. McMurty states: "We can therefore conservatively estimate by figuring on the vein or veins to a depth of 200 feet, and for the distance between the two shafts, together with a reasonable distance to the east of No. 4, altogether a distance of, say 1,000 feet, and by averaging the width to 7 feet it is 10 feet wide to the east of No. 1 on the surface, that we have 116,600 tons of ore. Figuring on three and a half per cent. copper content, we can reasonably conclude a net profit of $571,000."

Mr. McMurty points out: "This estimate, it must be remembered, does not include further high grade ore we are expecting in No. 4, nor the 4 per cent. blue quartz lead at the south of No. 4, nor the ore on the dumps, of which there is a considerable quantity, nor does it include the ore which we have in the bottom of the winze."

"The high grade ore is a direct smelting proposition. The lower grade material should probably be treated in a smelter on the ground reducing to a copper matte."

The company has made estimates, which show that it would be possible to set up and have running a 100 ton per 24 hours' smelting plant, for between $25,000 and $35,000.

**Jupiter Again Active.**—Resuming work after shut down caused by the strike, the Jupiter mine is now very busy in blocking out ore for the proposed new mill, plans for which have already been drafted. Ten to twelve drills are working underground, the company having rented the plant of the Plenaurum Mining Company. Recently a raise was put through from the 300 to 200 foot level, and here some of the best grade ore in the mine was found. At the 300 foot level there has now been developed an ore shoot 300 feet in length.

It is proposed that the Jupiter mill shall be financed out of the sale of the 157,214 shares as yet unissued.

**The Rea Mine** at Porcupine is being worked by the Mines Leasing Company on a 25 per cent. royalty basis. The little mill, which was purchased from the defunct Little Pet Mining Company, is now dropping stamps, and will treat between 17 and 18 tons per day. Before the old company abandoned the mine, there had been blocked out between the surface and the 200 foot level 10,000 tons of good milling ore, the shoot being from 180 to 200 feet long. No ore of milling grade was found at the 300 foot level, and the Mines Leasing Company will at once endeavour to pick up the vein.

**Petzite at Harricanaw.** In a specimen from the Maloney claim at Harricanaw, the Northern Quebec gold camp east of Cochrane, there has been discovered the telluride ore, petzite. It was taken from the lead which yielded some remarkable specimens of free gold. Very little work so far has been done on claims in this particular district, although there have been prospectors in there for a year and a half at least. The Harricanaw district is reached from Cochrane and the Transcontinental. The claims can be reached by water from the Transcontinental Railway at a point about 130 miles east of Cochrane.

**Hughes Porcupine.**—At the 300 foot level of the Hughes Porcupine mine good results are being obtained. The development at this level has so encouraged the directorate that they have had plans drawn for a much larger mill. The present little mill has a capacity of only about ten tons a day.

**Nickel Shipments from Alexo Mine.**—During the month of June the Alexo Mining Company shipped 12 cars of about 30 tons each from the nickel property near Iroquois Falls. All this ore is going to the Mond Nickel Company's smelter at Coniston. The ore is still being taken out from the open cut. This has now attained a depth of 40 feet. The ore is being mined for a width of about eight feet.

## COBALT, GOWGANDA AND SOUTH LORRAIN.

**Cobalt Townsite and Casey Cobalt.**—The production of the two principal English companies for the month of June by weeks was: Cobalt Townsite, June 7, 41,100 ounces; June 14, 41,500; June 21, 41,100; June 28, 40,100; total, 123,800 ounces. Casey Cobalt, June 7, 19,900 ounces; June 14, 20,000; June 21, 20,200; June 28, 20,000; total, 80,100 ounces.

**Beaver Consolidated.**—In the last quarterly report of the Beaver Consolidated Mining Company, the Beaver Auxiliary prospect at Elk Lake plays a prominent part. Mr. Frank L. Culver, in his report to shareholders, states that the Beaver Consolidated had already paid $40,000 for a three-quarters interest, leaving $30,000 still to pay. $34,800 has already been spent on development, and three-quarters of the amount, $26,100, had been paid by the Beaver Consolidated Mining Company. The shaft on the property is down to a depth of 194 feet, and the first cross-cutting will take place at the 280 foot level.

| | |
|---|---|
| The company's cash balance on May 31 was | $ 7,226.71 |
| Ore at smelters and in transit | 40,994.17 |
| Ore bagged ready for shipment | 50,932.27 |
| | $102,153.15 |
| Less accounts payable | 16,969.98 |
| Available balance | $ 85,183.17 |

**The Gowganda-Elk Lake Branch T. and N. O. Ry.**—There seems very little possibility that the T. and N. O. Railway will undertake the extension of the Elk Lake branch into Gowganda. In an interview, Mr. J. L. Englehart, the chairman of the T. and N. O. Commission, states that of the half dozen surveys taken in an effort to locate an extension to Gowganda, there had not been one route which would warrant the construction. However, survey parties are still in the field.

**Keeley Mine Has Good Ore.**—There appears every probability that Erhlich and Hamilton, the English syndicate which is working the old Keeley mine of South Lorrain, will exercise their option. Two excellent veins of high grade ore have been discovered at the 50 foot level, and one of these has also been found at the 100 foot level.

**Penn Canadian.**—Although the Penn Canadian developed an old mine to a good producer during the year, the first annual report shows a deficit. According to the president, Mr. Wm. J. Haines, the first 12 months' operations resulted in a loss of $24,211. He explains it as being "due to the exhaustion of ore, depreciation of plant and equipment, and annual proportion of deferred charges included among the assets."

**A New Vein at the Savage Mine.**—The most important discovery of the present year in the Cobalt camp was the cutting of an entirely new vein on the Savage property of the McKinley-Darragh-Savage Company. It is between two and a half to three inches wide of $5,000 ounce ore. In addition, the wall rock on both sides of the vein promises to make good milling grade.

The discovery was made in virgin territory. A crosscut, driven south from the No. 10 vein at the 140 foot level, cut the new ore body at a distance of 40 feet. The vein has a strike of east and west paralleling No. 10 vein.

## BRITISH COLUMBIA.

**Ore Receipts at the Consolidated Mining and Smelting Co.'s Smeltery at Trail** during the six months to July 1 have been about 170,000 tons. Exact figures are not yet available, but it is known that the aggregate for the half year will be approximately that quantity. A rough apportionment shows the sources from which ore was received to have been as follows: From mines in East Kootenay, 18,000 tons; Ainsworth, 5,000 tons; Slocan, 12,000 tons; Nelson, 5,000 tons; Rossland, 113,000 tons; Boundary, 4,000 tons; Lardeau and other small shipping districts, 1,000 tons; United States, 12,000 tons. These figures do not include ores milled, but only the concentrates from such ores. An estimate of the quantity of ore received at Boundary district smelting works during the same period places it at 950,000 tons, 620,000 tons at the Granby Co.'s smeltery at Grand Forks, and 330,000 tons at the British Columbia Copper Co.'s reduction works at Greenwood. Included in the latter amount is about 20,000 tons from United States mines; otherwise practically all the ore was from the several mines of the respective companies. Then, the production of the Britannia and other mines in the Coast district was probably about 100,000 tons for the half year. Allowing 100,000 tons for other ores, not sent to smelting works, but treated in stamp mills or concentrators, it s evident that the aggregate output of the lode mines f the province during the expired half of the year as been about 1,320,000 tons. As the aggregate for 912 was 2,688,000 tons, it would seem that this year's itput of ore has thus far been approximately similar the rate recorded for last year.

### A Brief Review.

Briefly reviewing the position, mention may be made the leading metal mines in the various districts, as der:

n East Kootenay, the Sullivan Group mines are the y important present producers of ore. Their output the half year has been nearly 18,000 tons.

West Kootenay, the several mining divisions thy of mention are: Ainsworth, Slocan, Nelson Trail Creek (Rossland). The Bluebell, near Koot- Lake, made a comparatively large output of lead- -somewhere about 30,000 tons. Other mines in worth division that sent out ore, though in com- ively small quantities, were the No. 1, Silver d, Florence Co.'s, and Utica. Development was ued on Retallack and Co.'s Whitewater group n several other properties.

Slocan district, the Lucky Jim and Noble Five shipped zinc ore, while the Rambler-Cariboo, ond-Eureka, Standard and Van-Roi sent out silver-lead products—ore and concentrate. The two last-mentioned also shipped zinc concentrate. Others that had more or less work done on them, and in some cases shipped ore, are the Payne, Ruth-Hope group, Slocan Star, Surprise, Silverite, Cinderella, Idaho-Alamo, Hewitt-Lorna Doone, L. H., Eastmont, Lily B. and a number on which operations were less important.

In Nelson division, the Queen Victoria (which shipped 13,000 tons of ore to the smeltery at Greenwood), Eureka, Granite-Poorman, Molly Gibson and Silver King group, in the northern part of the division; the Dundee, Yankee Girl and Wilcox, in Ymir camp; the Emerald and H. B.—both lead mines—near Salmo; the Queen and Motherlode, in Sheep Creek camp, and the Arlington and Second Relief, in Erie camp, constituted the chief working mines in this division.

Rossland mines, in Trail Creek division, made a production of about 123,000 tons, this including the ore concentrated at the mill of the Le Roi No. 2. Of this total about 102,000 tons was from the Consolidated Mining and Smelting Co.'s Centre Star and Le Roi groups, and practically all the remainder from the mines of Le Roi No. 2, Ltd. The destruction by fire a few weeks ago of the big head-frame, shaft-house, ore-bins, etc., of the War Eagle mine, while not seriously interfering with ore-production, occasioned the Consolidated Co. some inconvenience and loss. The Inland Empire gold mine and stamp mill, in this division, was operated when weather conditions permitted.

Turning to Boundary district, which produced between 900,000 and 1,000,000 tons of ore, it may be noted that both the Granby and British Columbia Copper companies continue to regularly maintain a comparatively large output of ore—the former from its big copper mines in Phoenix camp, and the latter from its Mother Lode mine and the New Dominion Copper Co.'s Rawhide mine. The Consolidated M. and S. Co.'s No. 7 mine shipped about 3,700 tons of ore to the company's smeltery at Trail. Additional plant and machinery was put in at the stamp mill of the Jewel-Denero Mines, Ltd., and preparations were made for mining and milling ore. Several other properties were worked in a small way, but they did not add much to the total of ore-production.

In Similkameen district, the only producer was the Hedley Gold Mining Co.'s Nickel Plate group, with an output of about 35,000 tons and a recovery of gold valued at approximately $450,000. The British Columbia Copper Co. continued doing exploratory work on a number of mineral claims on Copper Mountain, a few miles from Princeton, with results that are stated to promise favourably for the establishment there of a productive copper camp. Some work was done on placer-gold claims on Granite Creek, and the development of several mineral claims in Summit camp, at the head of the Tulameen River, was continued.

In the Coast district, the Britannia, near Howe Sound; the Marble Bay, on Texada Island; the Surf Inlet Gold mine, on Princess Royal Island; a considerable total of work in Omineca division of the Skeena country the important development work continued at the Granby Company's Hidden Creek mines, and the preparations for the establishment of a 2,000 ton smelting works; the operations of the Portland Canal Tunnels, Ltd., the Indian Mines, Ltd., and others in Portland Canal district, and the work done on Queen Charlotte Islands—all these contributed to a total of work and progress that augurs well for substantial improvement in the metal-mining industry of this district.

No detail can now be given relative to placer-gold mining in Cariboo and Atlin districts, nor of coal mining in various parts of the province. As to the former, it may be said that the gravel-washing season opened auspiciously, with much snow on the mountains and cool weather to ensure its melting only gradually. It is hoped that there will be plenty of water late into the summer, and that autumn rains will assist in prolonging the operating season. Concerning coal mining —it is thought that production is being well maintained in all the coal mining centres of the province, save only in Nanaimo district, where there are labour troubles.

### General Notes.

The low-level tunnel being driven by the Portland Canal Tunnels Co., about three and one-half miles from the town of Stewart, at the head of the Portland Canal, was in 1,400 ft. by about the middle of June. It is estimated that a further distance of 900 ft. will have to be driven to reach the fissure zone at that depth.

A drilling contest is to take place at Rossland on July 16, open to all union men in good standing. Fifteen minutes will be the time to be allowed for each team to drill. The first prize will be $100 and the second $50.

Development of the Milly Mae mine, near Burton Arrow Lake, will be continued this summer.

The 10-stamp mill of the Coronation Gold Mines, Ltd., operating on Cadwallader Creek, Lillooet mining division, has been started crushing ore from the company's mine nearby. It is stated that a mill will shortly be placed on the Pioneer claim, in the same locality.

Requiring siliceous ore for metallurgical purposes, the Consolidated Mining and Smelting Co. lately resumed work at its No. 7 mine, situated several miles from Boundary Falls, Boundary district. After having shipped nearly 4,000 tons of ore to Trail, operations were suspended.

A report published in Spokane, Washington, is to the effect that during four months, to May 1, ore shipments from the Rambler-Cariboo mine, Slocan, totaled 1,403 tons, as compared with 1,153 tons during the whole of 1912. The quantity of crude ore and concentrate received at Trail from that mine during six months, to July 1 inst., was approximately 1,600 tons.

Negotiations have been in progress for some time with the object of securing the use of the electrothermic smelting plant at Nelson for the purpose of completing the investigation, by the Mines Branch of the Canadian Department of Mines, of the application of electric melting to the zinc ores of British Columbia. It is probable that the plant will be in operation during the ensuing autumn.

## NOVA SCOTIA.

**Dominion Coal Outputs.**—During the first half of June the outputs were much reduced by absenteeism and general shortage of unskilled labour. Towards the end of the month, howeer, these conditions became much improved, and in the closing week of the month particularly, a high rate of production was obtained. During the week ending the 28th, the production of the Glace Bay mines was as under:

| | Tons. |
|---|---|
| June 23 | 15,506 |
| " 24 | 17,600 |
| " 25 | 17,307 |
| " 26 | 17,633 |
| " 27 | 18,130 |
| " 28 | 16,997 |
| Total | 103,203 |

This is the best sequence of outputs as yet obtained from the Coal Company's mines. The output for the month was 394,000 tons compared with 391,498 tons in June, 1912. The aggregate outputs to the end of the half year totalled 2,292,000 compared with 2,124,158 tons over the corresponding period of last year, a gain of 168,000 tons. The output of 18,130 tons for the 27th marks another record, which it is hoped will be again exceeded on several occasions during the coming summer. Following is the output of the individual collieries for this record day, and also for the month of June:

| | | |
|---|---|---|
| No. 1 | 2,082 | 44,000 |
| 2 | 3,147 | 68,000 |
| 3 | 526 | 9,200 |
| 4 | 1,437 | 33,000 |
| 5 | 762 | 18,800 |
| 6 | 1,198 | 22,200 |
| 7 | 813 | 17,900 |
| 8 | 297 | 6,400 |
| 9 | 1,285 | 30,500 |
| 10 | 694 | 16,000 |
| 11 | 222 | 3,900 |
| 12 | 1,257 | 29,600 |
| 14 | 1,671 | 36,000 |
| 15 | 844 | 18,100 |
| 16 | 1,079 | 22,400 |
| 21 | 600 | 12,600 |
| 22 | 216 | 4,600 |
| | 18,130 | 394,000 (Approximate) |

## QUEBEC.

**The Asbestos Industry** in the Thetford district has come to its own, and the prosperous times predicted for the past several years are now everywhere in evidence. Practically all the mines are working double shift and shipments are made as fast as the material can be produced. The fibre mines at Broughton are still idle, while of the three at Robertson but one is operating. The reason for the delay in these mines starting up is unquestionably the fact that the advance in prices has beer principally in crudes and long fibre and that the advanc in the price for short grades will be slow until the sui plus in these grades has been used up. Recent repor moreover, indicate that there is a steady cleaning up the various surplus stocks so that in a few months may expect the average price equal to those of 1908.

Wages have advanced from 17½ to 20 cents per hc for pit labourers, and several of the mines have c tracted for the mining and delivery of the ore. A g deal of labour has come into the camp and the pres supply is considerably in excess of what it was at time a year ago.

Mr. Theo Denis was a busy visitor to our city this week when he was making elaborate preparations fo visit of the Congress Geologique.

Mr. P. Hammerich, who has for the past two been mill superintendent for the Bell Asbestos Co accepted a similar position with the Jacobs Asbest

## PERSONAL AND GENERAL

J. B. Tyrrell is making a short visit to the i-canaw district in Northern Quebec to investigate recent gold discoveries.

Mr. T. F. Sutherland, assistant inspector ofs, has been appointed chief inspector of mines of io. to succeed Mr. E. T. Corkill.

The Lake Superior Mining Institute will hold its next annual meeting, August 26th to 30th, on the Mesabi Range, at places to be selected by the local committees as most convenient during the trip.

W. J. Woolsey, Thetford Mines, has returned from a nine months' business trip to Europe.

Chas. Spearman is superintending development work on the Burnside claims at Kirkland Lake.

A. E. Blair, Julio Madero and Raoul Madero, mining engineers, who took a prominent part in the Mexican revolution, are in New York City.

P. B. McDonald is at Gouverneur, N.Y.

Robt. Bryce is in charge of development work on properties south of Kirkland Lake.

H. K. Boysen has joined the staff of the Foster mine, Kirkland Lake.

Chas. H. Rogers, representing Ontario Porcupine Goldfields Company during the past year at Porcupine, leaves this month on a business trip to London, England.

Mr. Arthur S. Herbert has resigned his position as general manager of the Siemens Company of Canada, and has been appointed general manager of the branch offices of the Siemens Company in Australia.

W. Henderson Clark, managing director of the Anglo-French Exploration Company of London, England, and J. A. Denison, engineer in London for the same company, sailed from Quebec for Liverpool on June 26th on the Empress of Ireland, after having spent a month in the mining camps of Northern Ontario. They were accompanied on their trip by J. B. Tyrrell, who is their consulting engineer and representative in Canada.

The Roberts and Schaefer Company, engineers and contractors, Chicago, have just closed a contract with Mr. W. W. Keefer, president of the Pittsburg Term. Railway and Coal Company, and also the Millburn Coal and Coke Company, for the building of a large steel tipple at Keeferton, W. Va. The cost of this tipple will be about $30,000, and it will be equipped with the new Marcus combination screen and picking conveyor.

Mr. W. L. Anderson, formerly of Porcupine, has been appointed local manager for the Motherlode Sheep Creek Mining Co., with gold mine and stampmill in Sheep Creek Camp, Nelson mining division, British Columbia. Mr. Geo. E. Farish, of New York, resigned as general manager for the company several weeks ago. He left Nelson on a visit to New York, going via Montreal, at the end of June. Mr. John McMartin and associates are large shareholders in the Motherlode Co.

Mr. J. Berglund is in charge of diamond drilling operations for the British Columbia Copper Co., on a group of mineral claims that company is exploring under option of purchase, on Copper Mountain Similkameen, British Columbia. Four drills are being worked, and much development work is being done as well, under the superintendence of Mr. Ed. Berryman.

Mr. J. F. Fredin, formerly of Toronto, has for some time been engaged in doing mining engineering work for the British Columbia Copper Co. on Copper Mountain, near Princeton, B.C.

Mr. Jay P. Graves, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Co., accompanied by Mr. George W. Wooster, treasurer of the company, left Spokane late in June for Granby Bay, Observatory Inlet, B.C., on a visit of inspection of the company's Hidden Creek mine and the new smelting works being erected and equipped in its vicinity. On the coast the party was to be joined by Mr. A. C. Flumerfelt, of Victoria, who is also one of the directors, and Mr. F. M. Sylvester, assistant to Mr. Graves.

Mr. James J. Johns was given a valedictory smoker and made the recipient of a valuable present of silver plate and glass on the occasion of his leaving the Motherlode mine, near Greenwood, B.C., to proceed to Sudbury, Ontario, to begin his new duties of mine superintendent for the Dominion Nickel Co.

Mr. Frederick Keffer, geologist and mining engineer for the British Columbia Copper Co., recently examined a mine in Montana for that company. He was accompanied on his trip by Capt. Harry Johns, superintendent of the company's Kootenay mines.

Mr. I. L. Merrill, president of the Hedley Gold Mining Co., has returned to Camden, Maine, from a visit to Europe.

Mr. W. C. Thomas, of Vancouver, B.C., has been in Lillooet district, British Columbia. He was formerly manager of the smelting works at Boundary Falls, in the same province.

Mr. J. Trainor, who was at one time superintendent at the Sunset copper mine, in Boundary district, B.C., is now engaged in a similar capacity on the property of the Dividend-Lakeview Consolidated Gold Mining Co., on Kruger Mountain, Osoyoos mining division.

## STATISTICS AND RETURNS

### OUTPUT OF ONTARIO MINES FOR FIRST THREE MONTHS OF 1913

Returns made to the Bureau of Mines show that the output of the metalliferous mines and works of Ontario for the first three months of 1913 was as follows:

| Products. | Quantity. | Value. |
|---|---|---|
| Gold, oz. | 50,637 | 1,030,920 |
| Silver, oz. | 7,264,559 | 4,040,450 |
| Copper, tons | 3,075 | 436,328 |
| Nickel, tons | 6,311 | 1,309,870 |
| Iron ore, tons | 15,389 | 25,695 |
| Pig iron, tons | 181,042 | 2,506,175 |
| Cobalt, cobalt and nickel oxides, lbs. | 280,096 | 120,500 |

### COBALT ORE SHIPMENTS.

The ore shipments for the week ending July 5, 1913, were:

| Mine. | High. | Low. | Pounds. |
|---|---|---|---|
| Casey Cobalt | 1 | .. | 73,800 |
| Cobalt Townsite | 1 | .. | 56,500 |
| Cobalt Lake | 1 | .. | 60,900 |
| Dom. Reduction | 1 | .. | 86,900 |
| Coniagas | 2 | .. | 156,460 |
| Peterson Lake | 1 | .. | 59,650 |
| Cobalt Comet | 1 | .. | 63,700 |
| Trethewey | .. | 1 | 40,000 |
| | 8 | 1 | 597,900 |

The bullion shipments for the week were:

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 123 | 147,854.70 | $85,706.21 |
| O'Brien | 29 | 26,983.00 | 14,889.93 |
| Miller Lake O'Brien | 2 | 1,976.00 | 1,082.86 |
| | 154 | 176,813.70 | $101,679.00 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

July 8th, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 2.12½ | 2.37½ |
| Braden Copper | 6.37½ | 6.75 |
| Chino Copper | 33.00 | 33.37½ |
| Giroux Copper | 1.37½ | 1.62½ |
| Goldfield Cons | 1.68¾ | 1.75 |
| Greene Can. | 5.87½ | 6.00 |
| Inspiration Copper | 14.00 | 15.00 |
| Ray Cons Copper | 16.50 | 16.75 |
| Standard Oil of N. J. | 353.00 | 356.00 |
| Standard Oil of N. Y. | 430.00 | 450.00 |
| Standard Oil, pfd stock | 1025.00 | ...... |
| Standard Oil Subs | 700.00 | ...... |
| Tonopah Mining | 4.50 | 4.75 |
| Tonopah Belmont | 6.25 | 6.50 |
| Nevada Cons Copper | 14.12½ | 14.37½ |
| Yukon Gold | 2.25 | 2.50 |

### Cobalt Stocks.

| | Bid | Ask. |
|---|---|---|
| Bailey | .07½ | .08 |
| Beaver | .28 | .30 |
| Canadian | .20 | .22 |
| Chambers-Ferland | .19 | .21 |
| City of Cobalt | .49 | .51 |
| Cobalt Lake | .66 | .69 |
| Coniagas | 6.75 | 7.50 |
| Crown Reserve | 3.35 | 3.50 |
| Foster | .07 | .09 |
| Gifford | .04½ | .06¼ |
| Gould | .03½ | .03¾ |
| Great Northern | .16 | .16½ |
| Hargraves | .04 | .06 |
| Hudson Bay | 65.00 | 70.00 |
| Kerr Lake | 3.15 | 3.30 |
| La Rose | 2.20 | 2.40 |
| McKinley | 1.62 | 1.68 |
| Nipissing | 8.40 | 8.75 |
| Peterson Lake | .22½ | .22¾ |
| Right of Way | .04 | .06 |
| Rochester | .02½ | .04 |
| Leaf | .03 | .03¼ |
| Cochrane | 1.00 | 1.30 |
| Silver Queen | .04 | .05½ |
| Temiskaming | .33½ | .34½ |
| Trethewey | .33 | .36 |
| Wettlaufer | .11 | .13 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .01 | .02 |
| Crown Chartered | .00½ | .01 |
| Dome Extension | .09 | .09½ |
| Dome Lake | .75 | .90 |
| Dome Mines | 14.50 | 15.50 |
| Eldorado | .01 | .02 |
| Foley O'Brien | .25 | .27 |
| Hollinger | 15.75 | 16.25 |
| Jupiter | .37 | .38 |
| McIntyre | 2.00 | 2.25 |
| Moneta | .03½ | .05 |
| North Dome | .35 | .50 |
| Northern Exploration | .50 | 1.50 |
| Pearl Lake | .32¼ | .33 |
| Plenaurum | .75 | 1.00 |
| Porcupine Gold | .10 | .10½ |
| Imperial | .02 | .02½ |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .02 | .02¼ |
| Rea | .15 | .30 |
| Standard | .00½ | .01 |
| Swastika | .04½ | .05 |
| United | .01 | .02 |
| West Dome | .15 | .30 |

### Sundry.

| | | |
|---|---|---|
| American Marconi | ... | ... |
| Canadian Marconi | ... | ... |

## TORONTO MARKETS.

July 9—(Quotations from Canada Metal Co., Toronto).

Spelter, 5½ cents per pound.
Lead, 5.60 cents per pound
Tin, 45 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 15¼ cents per pound.
Electrolytic, 15½ cents per pound.
Ingot brass, 11 to 15 cents per pound.

July 9—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.00 to $20.50 (f.o.b. Toronto).
Midland No. 2, $20.00 to $20.50 (f.o.b. Toronto).

July 9—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, $7.00 per ton.
Coal, bituminous, $5.00 per ton for 1¼-inch lump.

## GENERAL MARKETS.

### Coke.

July 7—Connellsville Coke, (f.o.b. ovens).

Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.

July 7—Tin, straits, 40.50 cents.

Copper, Prime Lake, 14.80 to 14.90 cents.
Electrolytic Copper, 14.50 to 14.62½ cents.
Copper wire, 15.75 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.35 to 5.45 cents.
Sheet zinc (f.o.b. smelter), 7.00 cents.
Antimony, Cookson's, 8.45 to 8.55 cents.
Aluminium, 23.00 to 24.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $39.00 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| June 21 | 58 | 26¾ |
| " 23 | 58 | 26¾ |
| " 24 | 57¾ | 26⅝ |
| " 25 | 58¼ | 26$\frac{3}{16}$ |
| " 26 | 58⅛ | 26$\frac{3}{16}$ |
| " 27 | 58⅛ | 26$\frac{3}{16}$ |
| " 28 | 58⅛ | 26$\frac{3}{16}$ |
| " 30 | 58⅜ | 26$\frac{3}{16}$ |
| July 1 | 58⅛ | 26$\frac{3}{16}$ |
| " 2 | 58⅛ | 26$\frac{3}{16}$ |
| " 3 | 58¼ | 26⅞ |
| " 4 | .. | 27 |
| " 5 | 58⅜ | 26$\frac{15}{16}$ |
| " 7 | 58½ | 26$\frac{15}{16}$ |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# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

| | | | |
|---|---|---|---|
| **Dominion of Canada.** | Graham, S. N. | Smith, Alex H. | Smith, W. H. |
| **Ontario** | Gwillim, J. C. | Tyrrell, J. B. | Ross, J. G. |
| Astley, J. W. | Hassan, A. A. | Willmott, A. B. | Woolsey, W. J. |
| Cohen, G. W. | Haultain, H. E. T. | **Quebec** | **British Columbia** |
| Campbell & Deyell | Hille, F. | Cohen, S. W. | Ashworth, James |
| Carter, W. E. H. | Leckie, J. E. | DePencier, H. P. | Fowler, S. S. |
| Demorest, Stull & Low | Loring, F. C. | Hardman, J. E. | **FOREIGN-New York** |
| Evans, J. W. | McEvoy, Jas. | Hersey, Milton L. | Hassan, A. A. |
| Ferrier, W. F. | Scott, O. N. | Johnson, W. S. | |
| Forbes, D. L. H. | Segsworth, Walter E. | | |
| Forbes, H. L. | | | |

## ASSAYERS, CHEMISTS AND ORE TESTERS.

| | | | |
|---|---|---|---|
| **Dominion of Canada** | Canadian Laboratories, Ltd. | Dr. J. T. Donald | **Foreign-New York** |
| **Ontario** | **Quebec** | | Ledoux & Co. |
| Campbell & Deyell | Hersey, Milton Co., Ltd | | |
| Heys, Thos. & Son. | | | |

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

**CANADA**

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

**NEW BRUNSWICK and NOVA SCOTIA**

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

**QUEBEC**

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

**ONTARIO**

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.

**NORTH WEST PROVINCES**

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

**BRITISH COLUMBIA**

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

**YUKON AND NORTH WEST TERRITORIES**

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

**CANADA**

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

**NOVA SCOTIA**

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

**NEW BRUNSWICK**

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

**QUEBEC**

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

1202. Map 52A. Northeast part of the Serpentine Belt, Eastern Townships, Quebec. Geology. Scale 4 miles to 1 inch.

**ONTARIO**

750. Grenville Sheet. Parts of Counties of Ottawa, Argenteuil, Terrebonne, Two Mountains and Vaudreuil, Quebec and Carleton, Russell, Prescott and Glengarry, Ontario. Geology. Scale 4 miles to 1 inch. Reprint.

1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.

**ALBERTA**

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

**BRITISH COLUMBIA**

1260-1276. Maps 74A-90A. Geology of the Forty-ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.

1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch.

1247. Map 69A. Route map of part of Nass River, British Columbia. Scale 8 miles to 1 inch.

1168. Map 30A. Mother Lode and Sunset mines. Geology and Topography. Scale 400 feet to 1 inch; contour interval 20 feet

1200. Map 50A. Part of Portland Canal Mining Area. Topography. Scale 2 miles to 1 inch; contour interval 200 feet.

**YUKON and NORTH WEST TERRITORIES**

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

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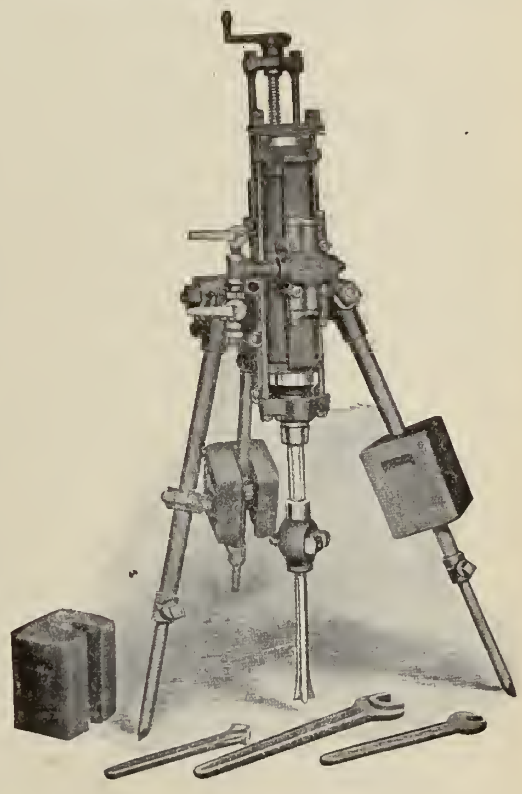

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## Department of Colonization, Mines, and Fisheries

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

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For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

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The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

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Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

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The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
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# ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

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Krupp, Fried. A. G., Germany.
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Dominion Bridge Co. ... ...
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Mussens, Limited.
Northern Canada Supply Co.
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B. Greening Wire Co., Ltd.
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Milton Hersey Co.
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Peacock Brothers.
Can. Fairbanks-Morse Co.
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**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
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Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
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**Jigs—**
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Canadian Allis-Chalmers, Ltd
Jenckes Machine Co.

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Fraser & Chalmers, Ltd.
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Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

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Northern Canada Supply Co.
Jones & Glassco.

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**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
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Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
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Peacock Brothers.
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Can. Bag Co.
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Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried. A. G., Germany.
Orford Copper Co.
Canada Metal Co.

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B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

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Sullivan Machinery Co.

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Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Bros.

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Peacock Bros.
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E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
E. Leonard & Sons.

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Standard Diamond Drill Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.

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Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
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Northern Canada Supply Co.
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Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
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Thos. & Wm. Smith.
M. Beatty & Sons.
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Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

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Mussens, Limited.
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Canadian Fairbanks-Morse Co
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E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
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Alex. Fleck.
The John Inglis Co., Ltd.

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Mussens, Limited.
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Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

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**Quarrying Machinery—**
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Canadian Allis-Chalmers, Ltd
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Krupp, Fried. A. G., Germany.

**Rolls—Crushing—**
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Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

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Jones & Glassco.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Peacock Bros.
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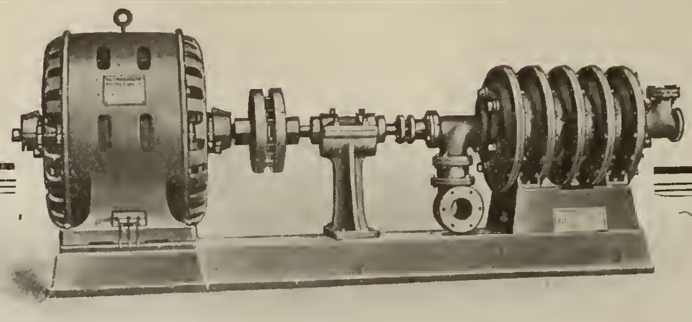

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VOL. XXXIV TORONTO No. 15



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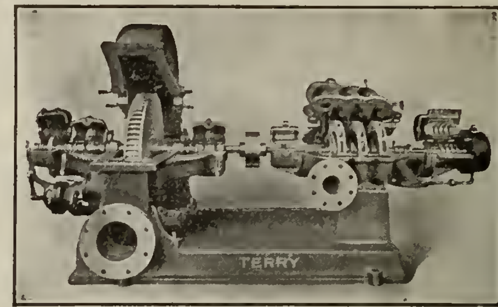


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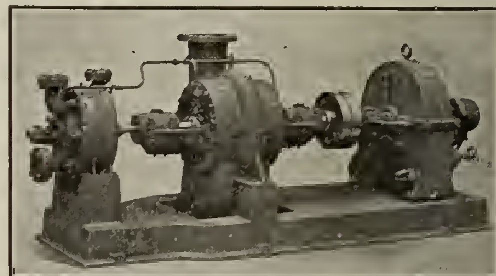

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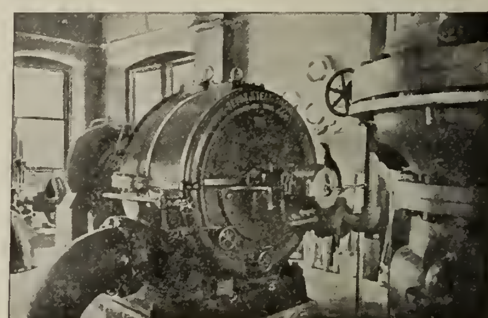

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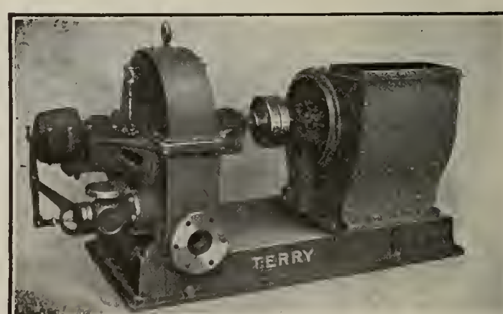


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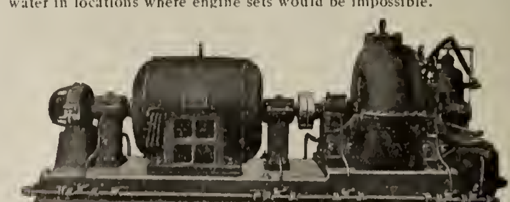

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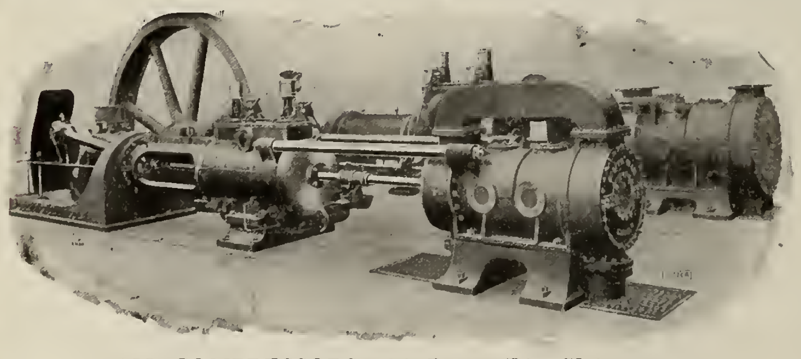

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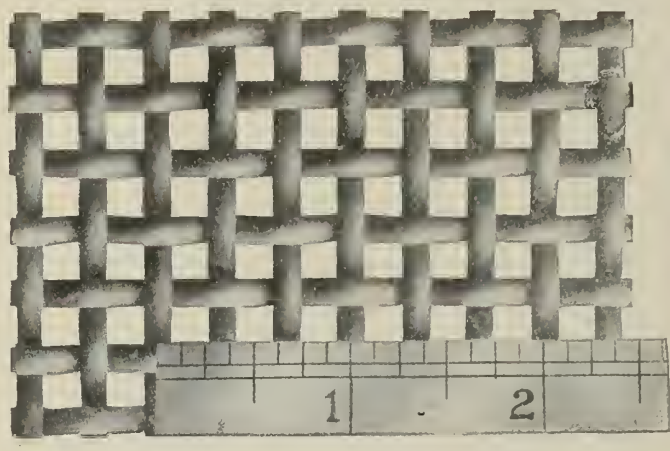


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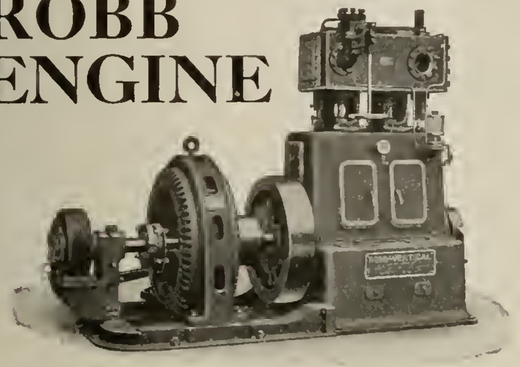



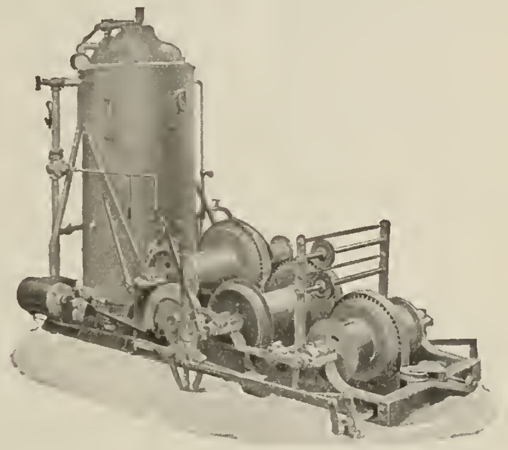



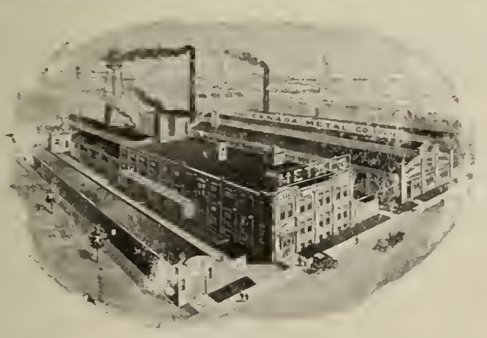

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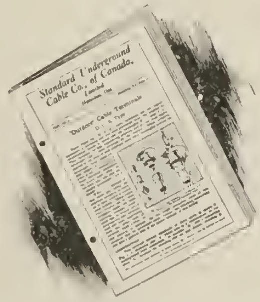

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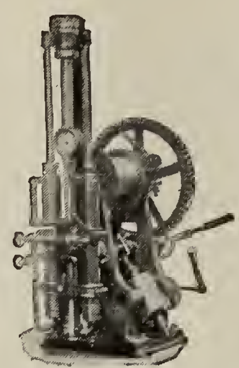

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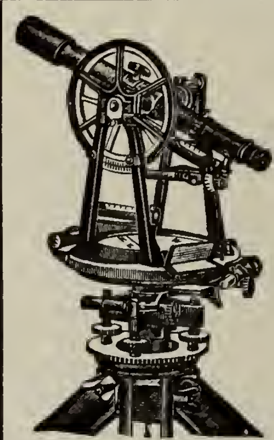

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, August 1, 1913. No. 15

## The Canadian Mining Journal

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.



## GOLD MINING ON THE RAND

The past few weeks have been marked by serious riots at Johannesburg. According to press reports several men have been killed in the streets by the government police and soldiers in an endeavour to maintain order. Gen. Botha, the ex-Premier, and Gen. Smuts, Minister of Mines, met representatives of the unions and arranged terms of settlement of the strike; but many of the miners have refused to return to work.

The government reports that 1,000 special police proved unable to check the riots and Viscount Gladstone, Governor-General of the Union of South Africa, sent 3,650 soldiers to Johannesburg at the request of the officials there.

What this labour disturbance means to the gold mining industry may be understood when it is known that the average number of rock drills in use at the Transvaal mines is over 6,000, the number having been doubled since 1908.

The Rand has long been the world's chief source of gold. The output has increased greatly in the last five years and in 1913 was £37,182,795, or about 40 per cent. of the world's output.

The South African Mining Journal in a recent issue computed the payable, fully exposed and fully valued tonnage of ore in reserve on December 31, 1912, in the chief producing mines at 87,387,462 tons. Adding ore partially developed or partially valued and tonnages in some smaller mines, a total reserve of 110,000,000 tons is arrived at. The estimated recoverable gold in this ore is estimated at $750,000,000. There is also standing developed in the mines a vast tonnage of low grade ore which may some time be profitably worked.

The enormous amount of work to be done in order to recover the values contained in the ore developed makes it specially unfortunate that labour disputes should intervene, and it is to be hoped that an early settlement of the strike will be made.

According to Canadian Press Despatches bearing date of July 7, a dispute is on over the actual terms of settlement which Gen. Botha and Gen. Smuts made with the unions. The unionists assert they insisted that the government provide for the miners whose places were taken by strike-breakers until new places should be found for them; that Generals Botha and Smuts agreed to this, but thought it inadvisable to put it into writing, and also that the leaders claimed amnesty for the rioters. Gen. Botha replying that that was a matter for the Department of Justice, but giving the impression that he favored amnesty.

The mine-owners say that the strike leaders are attempting to show that they concluded a better bargain than they did in order to strengthen themselves with the men.

## PRECIPITATION OF SILVER FROM CYANIDE SOLUTION BY ALUMINUM

In 1906 S. F. Kirkpatrick, Professor of Metallurgy, School of Mining, Kingston, undertook some experiments, with the assistance of the Ontario Bureau of Mines, on the ores of the Cobalt district in order to develop a commercial process of treating them and saving the by products. It was found that the ores were fairly amenable to cyanidation even when they contained 2,000 to 4,000 oz. silver per ton; but the cyanide consumption was heavy, and zinc was not an ideal precipitant, tending to foul the solution and give a bullion below market requirements. Mr. Kirkpatrick found that aluminum could be used satisfactorily, the difficulties experienced by earlier experimenters being overcome by using the metal in the form of a dust. The process was introduced by the Deloro Mining & Reduction Co., in 1908, and has been in use ever since. It is also in use at the O'Brien cyanide plant.

In a recent issue, June 28, of the Engineering and Mining Journal, Mr. Kirkpatrick describes the process and gives the results obtained. In another article in the May 10 issue of the same journal, Mr. E. M. Hamilton discusses the use of aluminum as a precipitant of silver at the Nipissing plant at Cobalt. Mr. Hamilton states that the arsenic and zinc in solution interfered seriously with extraction and that this difficulty was overcome by substituting aluminum for zinc. Owing to the fact that aluminum does not form any compound with cyanogen, not only is the whole of the cyanide recovered which was combined with the precious metals, but also the additional loss of cyanide by direct combination with the zinc is avoided.

## MAGMATIC WATER

Dr. A. P. Day at a recent meeting of the Geological Society of America exhibited a sealed glass tube about two feet long and an inch or more in diameter in which was about a pint of actual magmatic water. This was obtained by Dr. Day and Dr. E. D. Shepherd, of the Carnegie Geophysical Laboratory, from a little blister-cone a short distance from the main lake of lava at Kilauea. Through a pipe they exhausted from the immediate surface of a mass of molten rock the gases which were being given off and which above the tube became ignited as flames. From these gases the two investigators, at a safe distance, were able to condense in tubes unmistakable samples of water.

In view of the fact that some investigators have shown that the exhalations from volcanoes in some instances contain very little water and doubt has been thrown on theories based on the assumption that magmas contain water, the work of Dr. Day and Dr. Shepherd is of special interest. By Prof. Kemp, of Columbia University, that pint of water must have been viewed with loving eyes.

## IRON ORE CONTINUES TO GREAT DEPTH ON THE MARQUETTE RANGE

It was feared in the early days of iron mining in Michigan that the ore would not persist to any great depth; but the development work in recent years has shown that the iron formations are in many places ore-bearing at considerable depth. R. C. Allen, Director of the Michigan Geological Survey, in a recent report states that there is more ore in sight now than ever before. The Marquette district has shipped nearly 100,000,000 tons of iron ore and the mines have in sight above the bottom levels about 50,000,000 tons. According to C. K. Leith recent deep drilling in bottom horizons of the Negaunee formation "suggests that the beds of this horizon at great depths may ultimately be found to carry a larger tonnage of ore than those of any of the other horizons." Mr. Allen states that in the Marquette as well as in the Gogebic district development at great depth has changed what was formerly a hope into a practical certainty. Deeply buried portions of the iron formation are ore-bearing and are likely to be fully as productive as the shallower parts.

## THE TERRITORY OF NEW QUEBEC

The Mines Branch of the Department of Colonization, Mines and Fisheries has just sent out a volume containing extracts from reports on the District of Ungava, recently added to the Province of Quebec. The report was compiled from various sources and edited by Theo. C. Denis, Superintendent of Mines. It is accompanied by a large map, coloured geologically in parts where the necessary information was available. The chief source of such information has been the reports of explorations by A. P. Low and Robert Bell for the Geological Survey of Canada.

The report includes much useful information on water powers, physical geography, climate, soil, plants and fisheries. Detailed descriptions are given of the country along the main water routes.

While no originality is claimed for the contents of the report the work is a very useful one, as it makes the information on Ungava readily available.

# THE TWELFTH INTERNATIONAL GEOLOGICAL CONGRESS

The Twelfth International Geological Congress, which is to be held in Canada this year, gives promise of being a marked success. The governments of twenty-five different countries have signified their intention of sending official delegates, and various scientific institutions in thirty-eight countries will be represented. The membership already is about 800, consisting of leading geologists and mining engineers of the whole civilized world.

The session of the Congress will be held in Toronto on August 7 to 14, inclusive, during which papers of great general geological interest will be read and discussed. The most attractive feature, however, is the opportunity that will be afforded to visit the leading mining districts and points of greatest geological interest in the country. To this end a great number of excursions have been arranged for.

**The Late Sir W. E. Logan**
First Director, Geological Survey of Canada.

### Arrangements for the Session in Canada.

The Congress visits Canada this year on the invitation of the Government of Canada, transmitted through the foreign office and through the British Ambassador in Sweden. It was supported at the Stockholm session by Dr. W. G. Miller, for the Province of Ontario, and Dr. Frank Adams, who represented on this occasion the Government of Canada.

On December 2, 1910, an inaugural meeting was held in Toronto. It was called at the instance of the general secretary, R. W. Brock, acting for the government as the Director of the Geological Survey. At it were present representatives of the Institutions who had invited the Congress to be present in Canada and a small executive committee was appointed with instructions to appoint such other committees as might be required as and when they were required.

Committees dealing with the following subjects were appointed: Organization, coal resources, editorials, excursions, finance, leaders of discussions, official invitations, patronage, publications, qualifications for membership, Toronto local, transportation, and a committee to appoint an assistant secretary. Some of these committees have completed their work and have been dissolved, but most of these are still active and consist of one or two members of the Executive committee with in some cases other gentlemen but in each case they report direct to the executive committee which makes itself responsible for the financial arrangements.

Preparations were made for publication of a monograph on the Coal Resources of the World to consist of 1200 pages published in three volumes accompanied by an atlas of 70 maps. The work has been accomplished under the editorship of Messrs. William Mc-Innes and D. B. Dowling, and is a credit to the country.

The excursions will, no doubt, be the leading feature of the Congress and every effort is being made to make them attractive both to geologists and mining engineers. The itineraries of the excursions are contained in circulars distributed by the secretary. The guide books consist of fifteen volumes comprising a total of more than 1,600 pages and 140 maps.

The preparation of guide books for use on excursions has proven to be one of the most useful features of the sessions. By this means a great deal of information concerning the structural geology and ore deposits of the countries visited has been made available. The set of guide books prepared for the Canadian meeting covers practically all through railway lines and steamboat routes from Sydney in Cape Breton to Dawson in Yukon. They consist in all of 1,600 pages, contain well arranged notes, are of convenient size, are accompanied by geologically coloured maps and sections and make a notable contribution to the literature treating of the geology of the country. Their attractive appearance, the fine quality of the material entering into their make up, and the excellent typography reflect great credit upon the Government Printing Bureau by whom the printing was done.

## OBJECT AND WORK

Geology is defined as the science treating of the earth's history, and it includes the study of its mineral deposits and the floras and faunas which have successively clothed and peopled the earth's surface. The direct value of geological work is now fully recognized, especially by those connected with mining, civil and hydraulic engineering, it being daily applied not only to mining problems, but to many others, such as water supplies, foundations for bridges and large buildings, dams, road construction, etc. In fact, in the recognition of the commercial importance of geology there is danger that some branches of the science may be overlooked or slighted. It is well, therefore, to point out that in many cases the application of geology to engineering and commercial work has been made possible only by the study of problems which appear to be solely of scientific interest. The International Geological Congress takes care that all aspects of geology receive adequate consideration in its sessions.

The object of the International Geological Congress is, briefly, the advancement of knowledge concerning the earth both in the field of pure geological science and in its application to the arts and industries, through the association and co-operation of leading geologists and engineers of all nations.

The more important methods by which it endeavours to accomplish its aim are as follows:—

Meetings, publications, international committees, excursions and prizes.

Meetings.—The meetings are held every three years in different countries, and each session lasts from seven to ten days. The meetings are attended by members from every civilized country. The leading countries, societies and universities are represented by specially appointed delegates. Papers bearing on questions of general interest are read and discussed. As main topics for discussion subjects of scientific or economic importance are selected in advance so that every member who can contribute knowledge on the subject may be prepared to do so. In this way, the exact state of present knowledge on these topics is put forth and made known.

Publications.—The transactions of the Congress are published as soon after the session as possible. They contain the more important papers and discussions, and a general report on the business and work of the Congress. The transactions of the eleventh Congress form two volumes totaling 1,413 pages. In addition, a quarto volume of papers on "Changes of Climate since the Maximum of the Last Period of Glaciation," and two quarto volumes and a large atlas on "The Iron Ore Resources of the World" stand to the credit of the eleventh Congress.

International Committees.—Committees are formed to deal with questions requiring international or concerted action.

Such subjects as the standardization of geological colours and signs employed on maps, the standardization of geological nomenclature, and the planning of general geological maps covering an entire continent have been dealt with by these committees.

Excursions.—Excursions have become an outstanding feature of the sessions, special facilities being provided in the country in which the meeting is held to enable the delegates coming from every portion of the world to make, at small expense and under expert guidance, a personal study of its geological structure and mineral resources.

The value of the excursions is not confined to what is seen and learned. They afford the best opportunity for the members to fraternize and to become acquainted with each other and with each others' work and ideas. The informal discussions of the geological problems presented in the field and the information that is thus brought out concerning the methods employed in the various parts of the world in attacking and solving similar problems: and the use that has been found for neglected or little-known substances; these and similar discussions are perhaps the most instructive and valuable features of the Congress.

Prizes.—The Congress affords the necessary machinery for awarding prizes for special achievement in the science or application of geology. The Spendiarow prize, founded by a Mr. Spendiarow of St. Petersburg, Russia, in memory of his son, is awarded at each session for the most important work accomplished by an individual since the preceding session. Special prizes have been awarded at various sessions.

### Value of the Congress.

From even such a brief recital of the object and work of the Congress, its importance is evident, but a few other points may be touched upon. It has secured the co-operation of the governments of various countries, as well as of men of science that has resulted in the magnificent geological map of Europe now approaching completion. A similar geological map of the whole world will be undertaken. As an example of valuable international studies may be mentioned the very careful investigation into the iron ore resources of the world, the results of which are embodied in a series of magnificent volumes, in which the extent, quality and mode of occurrence of the iron ore resources of every country of the world are set forth, and illustrated by means of maps and plans. A similar plan of study is now in progress to determine the coal resources of the world, a full report of which will be issued in 1913 before the meeting of the Congress in Canada. The Congress serves, in a sense, as an international clearing house for geology. These great gatherings of distinguished scholars of all nationalities have aroused greater interest in geology on the part of private individuals, corporations and

Governments, given it a higher standing as a science, and rendered possible its increased economic application.

The country entertaining the Congress is repaid in many ways. The excursions are participated in by the more eminent geologists and mining engineers of the world, giving them a knowledge of its resources and possibilities, which they spread abroad, for they are the advisers of capital; the writers of text books and authoritative articles; and the instructors in universities and schools. Their criticisms and suggestions based upon their experience with similar problems and conditions in other parts of the world are helpful and stimulating to the home geologists and mining engineers. After leaving any country they have learned where to obtain reliable information concerning it and they follow its developments and discoveries as announced in the press and technical papers.

**Character of Attendance.**

Geologists from every quarter of the globe attend the Congress. The word "International" in the title was well chosen and the character of the attendance at each Congress has been remarkable for the number of different nationalities represented. As to the personnel of the members, they may be broadly classed in three divisions.

1st. Professors and teachers from the leading colleges and universities as well as the technical mining schools.

2nd. Officers of Government geological surveys or equivalent organizations.

3rd. Geologists and mining engineers in private practice.

**History.**

The foundation of the Congress was inspired by the collections of geological maps and sections from various regions of North and South America, as well as from many countries of Europe which were shown at the International Exhibition in Philadelphia in 1876. The advantage of such comparative study so deeply impressed visiting geologists that at the annual meeting of the American Association for the Advancement of Science held in Buffalo, August, 1876, a committee was appointed to arrange for an international congress of geologists at the 1878 Paris Exhibition.

It is interesting to note that Dr. T. Sterry Hunt, who from 1847 to 1872 was chemist and mineralogist to the Geological Survey of Canada, was Secretary of this first committee—the Comite Fondateur of 1876, and at the first session of the Congress, held in Paris in 1878, Messrs. A. R. C. Selwyn, T. Sterry Hunt and Paul de Caze were the Canadian delegates, twenty-three countries being represented.

## ORGANIZATION OF THE CONGRESS

The following paragraphs are from a circular sent out to geologists in the year 1876 by D. T. Sterry Hunt and associates. It presents the aims of the men who organized the Congress.

"The activity which has prevailed in the study of geology within the past generation has given to it a great importance both from a scientific and an economic point of view, and has resulted in a large accumulation of facts and materials. Workers in different countries have, however, pursued their labours to a great extent independently of each other, and have given their results in such ways that it is often difficult to co-ordinate them. Those geologists from Europe and America who have been at the International Exhibition at Philadelphia in 1876, have found there important collections of geological maps and sections, with rocks and organic remains from various regions of North and South America, as well as from many countries of Europe, and they have become deeply impressed with the great advantages to be gained by their comparative study. It was, moreover, evident that the bringing together of a still larger number of such collections in accordance with a previously arranged plan, could not fail to lead to important results for geological science. The International exhibition to be held at Paris in 1878 will furnish such an occasion, and it is proposed to invite to that end governmental geological surveys, learned societies and private individuals throughout the world, to send to Paris such collections as will make the geological department of that exhibition as complete as possible.

"In order to take advantage of the collections which may thus be brought together it is moreover proposed to convoke an International Geological Congress, to be held at Paris at some time during the Exhibition of 1878, and to make that Congress an occasion for considering many disputed problems in geology.

**The Late Dr. T. Sterry Hunt**
**Secretary of the Committee of 1876**

"In accordance with this plan it is proposed that the geological department of the International Exhibition of 1878 shall embrace:

"I. Collections of crystalline rocks, both crystalline schists and massive or eruptive rocks, including the so-called contact formations and the results of the local alteration of uncrystalline sediments by eruptive masses. In this connection are to be desired all examples of organic remains found in crystalline rocks, including Eozoon and related forms. These collections should moreover comprehend all rare and unusual rocks of special lithological, mineralogical and chemical interest, examples of ore-deposits and of veinstones of all kinds, with their encasing rocks. As far as possible these collections should be limited to specimens of

# PATRONS

*Honorary President:*

**His Royal Highness, the Duke of Connaught Governor-General of the Dominion of Canada,**

*Honorary Vice-President:*

**Prime Minister of the Dominion of Canada and Secretary of State for External Affairs**

*Honorary Vice-President:*

**Hon. L. Coderre, Minister of Mines, Ottawa**

*Honorary Vice-President:*

**Hon. Frank Cochrane, Minister of Railways and Canals, Canada**

*Honorary Vice-President:*

**Hon. W. H. Hearst, Minister of Lands, Forests and Mines of Ontario**

a size convenient for examination, and be accompanied with sections prepared for microscopic study. In the arrangement of all these materials regard should be had to their natural associations rather than to theoretical notions or artificial classifications, so that they may be studied not only petrographically but geognostically.

"II. Collections illustrating the fauna and the flora of the paleozoic and more recent periods, particularly of such horizons as present a more critical interest to paleontologists from the first appearance or the disappearance of important groups of organic forms. It has appeared to the committee named below that the organic remains of the Cambrian, Taconic or so-called Primordial strata merit especial attention in this connection.

"These various collections should be explained as fully as possible by labels, catalogues, monographs and maps.

"III. Collections of geological maps, and also of sections and models, especially such as serve to illustrate the laws of mountain structure. In the geological maps regard should be had to various questions which deserve the special consideration of the Congress, such as the scales best adapted for different purposes, the colours and symbols to be used, and the proper mode of representing superficial deposits conjointly with the underlying formations. A discussion of these will prepare the way for improved general geological maps of the continents.

"In pursuance of the above plan the American Association for the Advancement of Science during its annual meeting at Buffalo, under the presidence of Prof. William B. Rogers, unanimously adopted the following resolution on the 25th of August, 1876:

"Resolved, That a Committee of the Association be appointed by the chair to consider the propriety of holding an International Congress of Geologists at Paris during the International Exhibition in 1878, for the purpose of getting together comparative collections, maps and sections, and for the settling of many obscure points relating to geological classification and nomenclature. And that to this committee be added our guests, Prof. T. H. Huxley, of England; Dr. Otto Torell, of Sweden, and Dr. E. H. von Baumhauer, of the Netherlands, who shall be requested to open negotiations in Europe looking to a full representation of European geologists at the proposed Congress. The said committee to consist of Prof. William B. Rogers, Messrs. James Hall, J. W. Dawson, J. S. Newberry, T. Sterry Hunt, C. H. Hitchcock and R. Pumpelly in behalf of the Association, with the addition of Prof. T. H. Huxley, Dr. Otto Torell and Dr. E. H. von Baumhauer.

"On the same day, at a meeting of the Committee, Prof. James Hall was elected chairman, and Dr. T. Sterry Hunt, secretary. It was then resolved to prepare the present circular, to be printed in English, French and German, and distributed to geologists throughout the world, asking their co-operation in this great work of an International Geological Exhibition and an International Geological Congress to be held at Paris in 1878; the precise date of the Congress to be subsequently fixed.

"All those interested in this project are invited to communicate with any one of the following members of the Committee: Prof. T. H. Huxley, London, Eng.; Dr. Otto Torell, Stockholm, Sweden; Dr. E. H. von Baumhauer, Harlem, Holland; Dr. T. Sterry Hunt, Boston, Mass., U. S. A."

Boston, Massachusetts, Sept., 1876.

*Honorary Vice-President:*

**Hon. E. H. Armstrong, Commissioner of Works and Mines of Nova Scotia**

## QUEBEC AND MARITIME PROVINCE EXCURSION

### The A1 Excursion.

The first excursion in connection with the Twelfth Congress left Montreal at 1 o'clock Monday morning, July 14, for points in Quebec, New Brunswick, Nova Scotia and Cape Breton.

**Str. Virginian with several geologists on board arriving at Montreal**

Dr. G. A. Young, leader; E. R. Faribault, associate leader; R. Harvie, secretary, and A. Mailhiot, assistant secretary for this excursion, looked after the members as they arrived. Dr. F. Adams, president of the Congress; W. S. Lecky, secretary, and P. D. Quensel, who was secretary of the last Congress in Sweden, were on hand to make the final arrangements and see the excursion well started. Dr. Adams and Mr. Lecky went as far as Quebec and Dr. Quensel stayed with the party for several days.

A special train on the Intercolonial Railway carries the party of about 50 members. There are plenty of sleepers and two diners on the train. In the baggage cars a box is provided for each member to store specimens, etc., collected on the trip.

The train reached Levis early Monday morning. Here Dr. Percy Raymond, guide for the day, joined the party, and directly after breakfast a visit was made to points of interest about the town.

Splendid exposures of the Levis and Sillery formations were seen in the cliff back of the town. Dr. Raymond pointed out many of the most noteworthy features of the geological structure.

The rocks on either side of the St. Lawrence at this point are quite different. Between Levis and Quebec there are two major faults, known as the St. Lawrence and Champlain. On the Levis or hanging side the rocks exposed are much crumpled and folded, while on the Quebec or foot side the rocks have been less disturbed.

It is thought that forces acting from the southeast have forced the Levis and Sillery formations up and over so that they now appear, on casual examination, to be stratigraphically higher than what are in reality younger rocks on the Quebec or northern shore.

During the morning the party visited several good exposures at Levis, where the folded and faulted structure of the rocks could be studied. On Davidson Street a well-exposed sharp anticline was seen. At other points conglomerate beds among the shales were followed and found to pinch out. In several places fossil hunters were rewarded by interesting discoveries. Many expressed a desire to visit the locality again. Owing to poor exposures in some interesting places the actual contact between the Sillery and Levis formations could not be carefully studied. Dr. Raymond stated that the evidence indicates a fault between the formations in a little ravine visited by the party. Some of the members, from their brief examination, were led to express very diverse views; but an armistice was arranged until more careful examination has been made by the exponents of opposing views.

About noon the party crossed by ferry to the Quebec side of the St. Lawrence and went by electric cars to Montmorency Falls. Here lunch was served at Kent House. An address of welcome on behalf of the City of Quebec was delivered by Sir Georges Garneau. Dr. Frank Adams replied on behalf of the Congress, and extended Canada's welcome to the members from abroad. He then called on Dr. P. M. Termier, Director of the Geological Survey of France, Dr. B. Weigand of Strassburg, and Dr. A. Strahan, of the Geological Survey of Great Britain, who responded on behalf of France, Germany and Great Britain respectively.

After luncheon the exposures in the vicinity of Montmorency Falls were visited, and the structural features were explained by the guides. It was pointed out that a major fault exists here, that the rocks above the falls are older than those below, that above the falls the Trenton beds lie almost in their original position on the eroded surface of Archean gneiss, and that at the foot of the falls, the Paleozoic rocks have been brought down against the Archean by a normal fault. At the brink of the falls there are remarkably good exposures, showing the fossiliferous Trenton limestone lying on the Archean gneiss. According to Dr. Raymond the sponges and corals are standing practically in the position in which they grew on the Archean floor.

After examining the exposures above the falls the party went down below and saw good evidence of the

*During a Shower at Levis*

**E. O. Ulrich, U.S.A.; L. M. Lambe, Canada; H. P. Cushing, U. S. A.; E. R. Faribault, Canada**

faulted structure . The fossiliferous beds were here industriously attacked by the European and American visitors. The German geologists were especially busy with their little hammers, as may be seen in some of the accompanying photographs.

**Dr. B. Weigand, Germany**

Professor B. Weigand, delegate of the Oberrheinischer Geologischer Verein, Stuttgart, is the eldest of the German visitors. He is an indefatigable traveller and is noted for his custom of choosing the longest excursions. In Sweden he was one of the few who made the trip to Spitzbergen. This year he intends to be a member of the party which will go to the Yukon. Dr. Weigand always has been much interested in the study of earthquakes and was the first to systematically record the shocks.

**Chutario Kido**
**Director of the Geological Institute South Manchuria Railway Company, Tokyo, Japan**

**Aubrey Strahan, F.R.S.**
**Director Geological Survey of Great Britain**

**P. M. Termier**
**Director Geological Survey of France**

P. M. Termier, Director of the Geological Survey of France, has made a special study of the changes in rocks brought about by mountain building forces and has done much towards making clear Alpine geology. He is a delegate of the Service de la Carte Geologique de la France, the Societe Francaise de Mineralogie, the Ecole Polytechnique, Paris, and of the Association Amicale des Eleves de l'Ecole Nationale Superieur des Mines, Paris.

**Anticline in Levis formation, Levis, Quebec**

By electric cars the party returned to Quebec. Here carriages furnished by the city were waiting for the members. A long drive through the historic town up the hill and out past the Plains of Abraham and back along the shore road to the ferry completed an interesting afternoon.

In the evening the members attended a reception by the city, held at Laval University. The buildings and equipment were shown to the guests and proved to be much more pretentious than had been thought by many. The equipment of the scientific laboratories is remarkably good and elicited much praise.

After listening in the University gardens to a programme rendered by the Guards band, and partaking of refreshments, the party returned to the train, much pleased with the splendid reception accorded them by the City of Quebec. Early next morning a start was made for Riviere du Loup and other points in Quebec and the Maritime Provinces.

The officers of A1 excursion are:—

Leader—G. A. Young.

Associate Leaders—J. M. Clarke, E. R. Faribault.

Secretary—R. Harvie.

Assistant Secretary—A. Mailhiot.

The following members have registered or will join the party en route:—

Andree, K., Dr., Privatdozent fur Geologie an der Universitat Marburg, Germany.

Arlt, Hans. Dr., Kgl. Bergassessor, Herzogparkstrasse 2, Munchen, Germany.

Bailey, L. W., Professor, University of New Brunswick, Fredericton, New Brunswick.

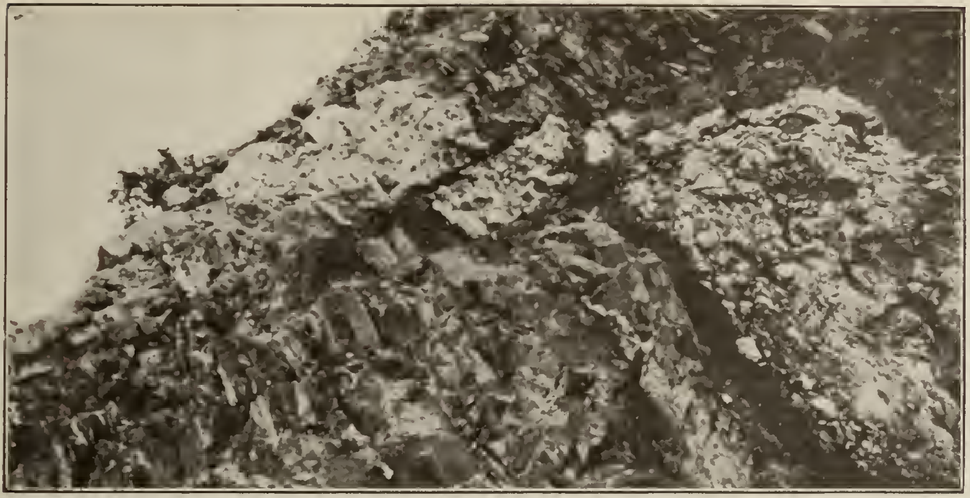
Bancroft, J. A., Dr., Associate Professor of Geology, McGill University, Montreal.

Barrows, W. L., M.A., 28 Brownell Avenue, Hartford, Conn., U.S.A.

Bell, W. A., St. Thomas, Ontario.

Boden, K., Dr., Privatdozent fur Geologie der Universitat, Geologisches Institut, Alte Akademie, Munchen, Germany.

**Examining a conglomerate bed at Levis**



**Faulted conglomerate bed, Levis, Quebec**

Burling, L. D., Geological Survey of Canada, Ottawa.

Cadell, H. M., Grange, Linlithgow, Scotland.

Caillebotte, Jean, Paris, France.

Carruthers, R. G., H. M. Geological Survey, 33 George Square, Edinburgh, Scotland.

Clarke, John M., Dr., New York State Geological Survey, Albany, New York, U.S.A.

Cole, L. H., Department of Mines, Ottawa.

Cushing, H. P., Dr., Professor of Geology, Western University, Cleveland, Ohio, U.S.A.

Faribault, E. R., Geological Survey of Canada, Ottawa.

Gardner, S. Mc., Mining Student, Mount Vernon Colliery Co., Ltd., Glasgow, Scotland.

Goldman, M. J., Dr., Johns Hopkins University, Baltimore, U.S.A.

Gurich, Georg. Dr., Professor, Lubeckertor 22, Hamburg, Germany.

Haniel, C. A., Dr., Venusbergweg 8, Bonn a. Rh., Germany.

Hartnagel, Chris., Education Building (State Museum), Albany, U.S.A.

Harvie, R., Dr., Geological Survey of Canada, Ottawa.

Hayes, A. O., 112 Mercer Street, Princeton, New Jersey, U.S.A.

Haycock, E., Professor of Geology, Acadia College, Wolfville, Nova Scotia.

Hobson, B., Thornton, Hallamgate Road, Sheffield, England.

Holbrook, E. A., Prof., Nova Scotia Technical College, Department of Mining Engineering, Halifax, N.S.

Holtedahl, Olaf, Dr., Maitre des conferences, Universitetets mineralogiske Institut, Kristiania, Norway.

Hore, R. E., Canadian Mining Journal.

Howley, J. P., Director of the Geological Survey of Newfoundland, St. John, Newfoundland.

Hudson, J. G. S., Mines Branch, Department of Mines, Ottawa.

Hyde, J. E., School of Mining, Kingston, Ontario.

Jehu, J. T., Dr., The University, St. Andrews, Scotland.

**Viewing an Exposure of Levis formations**

M. B. Baker, Kingston    E. M. Kindle, Ottawa    E. O. Ulrich, U.S.A.    H. P. Cushing, U.S.A.    A. C. Lawson, U.S.A.

**At Levis Quebec**

P. D. Quensel, Sweden ; W. Paulcke, Germany ; S. Powers, U. S. A.; Mlle. M. Termier and P. M. Termier, France ; R. Zuber, Austria ; Abbe R. Guimond, Quebec

Kido, Chutario, Dairen, Kantoshu, Manchuria.

Kindle, E. M., Dr., Geological Survey of Canada, Ottawa.

Lambe. Lawrence M., Geological Survey of Canada, Ottawa.

Lawson, A. C., Dr., Professor of Geology, University of California, Berkeley, California, U.S.A.

Lindeman, E.. Mines Branch. Department of Mines, Ottawa.

Lory, P., 6, rue Fantin-Latour, Grenoble, France.

Mailhiot, A., Professor of Geology, Laval University, Montreal.

Martius, S. G., Dr., Assistant am mineralogish-petrographischen, Institut der Universitat Bonn, Poppelsdorfer Schloss, Bonn a. Rh., Germany.

Matthew, G. F., Dr., St. John, New Brunswick.

McIntosh, D., Professor of Geology, Dalhousie University, Halifax, Nova Scotia.

Michalon, Lucien, Ingenieur des Mines. 96 rue de l'Universite Paris. France.

**At Levis, Quebec**

H. P. Cushing, U.S.A; F. D. Adams, Canada; and W. Paulcke, Germany

**At the Foot of Montmorency Falls**

P. Zoude, Belgium and P. D. Quensel, Sweden

**At Montmorency Falls**

M. B. Baker, Kingston; Percy Raymond, Harvard, U.S.A.; P. Zoude, Belgium; Theo. Denis, Quebec

Mitscherlich, H. E., Bergingenieur, Parkstrasse 9, Karlsruhe, Germany.

Part, G. M., Trinity College, Cambridge, England.

Pauleke, W., Dr., Professor der Geologie an der Grossh. Badischen Technischen Hochsehule Fridericiana, Karlsruhe, Baden, Germany.

Powers, S., Technology Chambers, Boston, Mass., U.S.A.

Pruvost, P., 159 rue Brule-Maison, Lille, France.

Quensel, Percy D., Dr., Lecturer in Petrography, University of Upsala, Upsala, Sweden.

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Raymond, Percy, Assistant Professor of Paleontology, Harvard University, Cambridge, Mass., U.S.A.

Riedel, A. J., Gausstrasse 25, Braunschweig, Germany.

Saint-Clivier, Hubert, Paris, France.

Schuchert, C., Professor of Geology, Yale University, New Haven, Conn., U.S.A.

Strahan, A., Dr., 28 Jermyn Street, London, S. W., England.

Stolley, E., Dr., Professor, Technische Hochschule, Braunschweig, Germany.

Termier, Mlle M., 164 rue de Vaugirard, Paris XV., France.

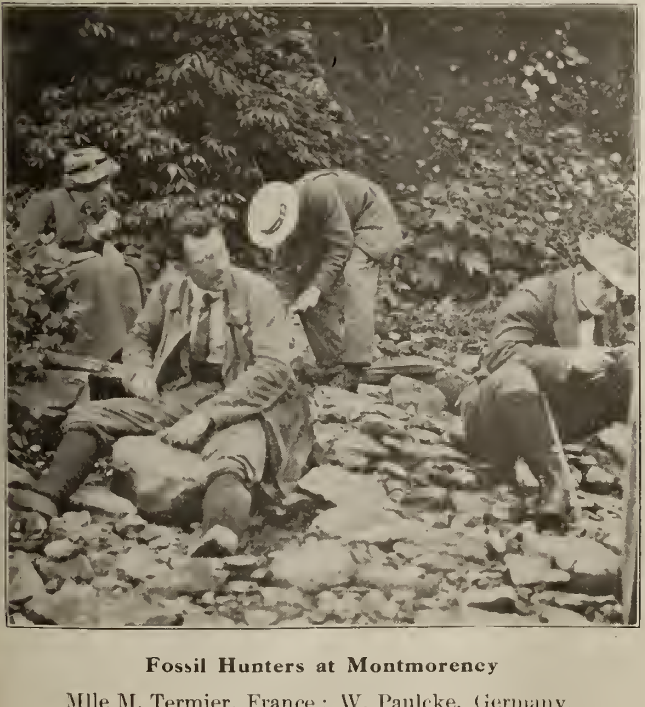
Termier, P. M., Directeur du Service de la Carte Geologique de France, 164 rue de Vaugirard, Paris XV., France.

Tillman, N., Dr., Lennestrasse 19, Bonn a. Rhein, Germany.

Tolmacev, I. P., Conservateur en Chef du Musee Geologipue Pierre le Grand de l'Academie Imperiale des Sciences, St. Petersbourg, Russia.

Twenhofel, W. H., Dr., Lawrence, Kansas, U. S. A.

Ulrich, E. O., 2421 First Street, Washington, D.C., U. S. A.



**Fossil Hunters at Montmorency**

Mlle M. Termier, France; W. Paulcke, Germany, H. E. Mitscherlich, Germany

**Dr. A. C. Lawson, U.S.A.**

**Trenton limestone lying on eroded surface of Archean gneiss, Montmorency Falls, Quebec**

von Grote, F., Dr., Martiusstrasse 1, Munchen, Bayern, Germany.

Welter, O. A., Dr., Neringstr., 4, Bonn a Rh., Germany.

Weigand, B., Dr., Professor, Schiessrain 7, Strassburg i. Elsass, Germany.

Wigglesworth, E., Geological Museum, Cambridge, Mass., U. S. A.

Williams, H. S., Dr., Professor of Geology, Ithaca, N. Y., U. S. A.

Woodworth, J. B., Professor, Harvard University, Geological Museum, Cambridge, Mass., U. S. A.

Wordie, J. M., Professor, St. John's College, Cambridge, England.

Wright, W. J., Bear River, Nova Scotia.

Young, G. A., Dr., Geological Survey of Canada, Ottawa.

Zoude, P., Ingenieur civil des Mines, 109 Boulevard de Grande-Ceinture, Bruxelles, Belgium.

Zuber, R. Professor der Geologie, Universitat, Lemberg, Austria.

**At Montmorency Falls**

R. Zuber, Austria; P. D. Quensel, Sweden; Percy Raymond, U. S. A.; M. B. Baker, Canada; W. Pauleke, Germany H. E. Mitscherlich, Germany; Chris. Hartnagel, U. S. A.; Theo. Denis, Canada.

Professor Dr. R. Zuber, delegate of the K. K. Franzens Universitat, Lemberg, is an oil specialist. He has made a study of most of the important oilfields of the world and is a prominent authority.

## PROGRAMME FOR THE SESSION AT TORONTO

The following programme is provisional and subject to change. The Secretary will be glad to receive suggestions. If requested by the Presidents or Secretaries, special time will be alloted for meetings during the Session of any of the International Committees.

The following sections have been suggested:

Section 1—(a) Pre-Cambrian; (b) Economic; (c) Petrology, Mineralogy, etc.

Section 2—Paleontology and Stratigraphy.

Section 3—Glacial Geology and Physiography.

*President, Twelfth Session*

**Frank D. Adams, F. R.S., Dean of the Faculty of Applied Science and Logan Professor of Geology, McGill University**

Wednesday, August 6th.—8.00 p.m., Reunion and informal reception by the Toronto Local Committee. Costume de voyage. Convocation Hall, University of Toronto.

Thursday, August 7th.—10.00 a.m. Meeting of Council for organization and appointment of Bureau. 12.00 noon, Opening General Meeting, Convocation Hall. 3.00 p.m., General Meeting—Reports of International Committees of the Congress. 8.00 p.m., Popular lecture in Convocation Hall, University of Toronto.

Friday, August 8th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Topic No. 1. 2.30 p.m., Section 1: Topic No. 2; Section 2: Topic No. 6. 1.15 p.m., Ladies' Luncheon. All day, Excursion B-3, Hamilton.

Saturday, August 9th.—9 a.m. Meeting of Council. 10.00 a.m., General Meeting: Topic No. 7. 2.30-4 p.m., Section 1: Topic No. 3; Section 2: Topic No. 7 continued. 4.30 p.m., A Garden Party will be given to the members of the Congress by Mr. and Mrs. D. A. Dunlap. All day, Excursion B-5, Moraines north of Toronto. Evening, Excursions 8-6, Muskoka, and B-10, Madoc, leave.

Monday, August 11th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Proposals and continuations of Reports of International Committees. 2.30 p.m., Section 1: Topic No. 5; Section 2: Miscellaneous; Section 3: Miscellaneous. Evening, Reception by His Worship the Mayor and Aldermen of the City of Toronto at the City Hall.

Tuesday, August 12th.—Excursions only.—All day, Excursion B-1, Niagara; B-2, Don and Scarboro; B-4, Credit River.

On application being made by ten or more members, excursions will be arranged to any accessible point and leaders provided.

Wednesday, August 13th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Topic No. 3. 2.30 p.m., General Meeting: Topic No. 4. All day, Excursion B-7, Streetsville; Excursion B-9, Orillia Afternoon, Excursion B-8, Clay Deposits. Evening, Banquet.

Thursday, August 14th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Miscellaneous Business, and close of the Twelfth Session. 3.00 p.m., Special Convocation of the University of Toronto at which honorary degrees will be conferred. 4.15 p.m., Garden Party. Evening, Excursions C-1 and C-2, leave.

*General Secretary, Twelfth Session*

**R. W. Brock, F.R.S.C., Director of the Geological Survey of Canada**

### Topics for Discussion.

Topic No. 1.—Coal Resources of the World.—There are no separate papers, but the discussion on this subject will be based on the Monograph which has been in preparation for the last two and a half years under the direction of the Executive Committee of the Twelfth Session in Canada. Information has been supplied by Government Officials, Geological Surveys, Mining Bureaus and geological and mining engineers throughout the world. It has been edited by the members of the staff of the Geological Survey of Canada. The Monograph will be published in three volumes and one atlas, and the price for the set will be $25.00 net. The publishers are Messrs. Morang & Company, Limited, Toronto, Canada. The members of the Twelfth Session, have the privilege of buying one set at the price of $20.00 net, provided their order reaches the publishers or the Secretary of the Congress on or before August 15th of this year, 1913.

Topic No. 2.—Differentiation in Igneous Magmas.—Messrs. F. Becke, Austria; R. A. Daly, U.S.A.; A. Harker, England; W. H. Hobbs, U.S.A.; J. P. Iddings, U.S.A.; F. J. Loewinson-Lessing, Russia; D. Platania, Italy; H. S. Washington, U.S.A.; and others have promised to take part in the discussion or to present papers.

Topic No. 3.—The Influence of Depth on the Character of Metalliferous Deposits.—Messrs. W. H. Emmons, U.S.A.; L. L. Fermor, India; J. F. Kemp, U.S.A.; P. Krusch, Germany; Louis de Launay, France; W. Lindgren, U.S.A.; Malcolm Maclaren, England; and others have promised to take part in this discussion or to present papers.

Topic No. 4.—The Origin and Extent of the Pre-Cambrian Sedimentaries.—Messrs. H. Baeckstroem, Sweden; J. Horne, Scotland; C. K. Leith, U.S.A.; J. J. Sederholm, Finland; and others have promised to take part in the discussion or to present papers.

Topic No. 5.—The Sub-divisions, Correlation and Terminology of the Pre-Cambrian.—Sir T. H. Holland, England; Messrs. A. C. Lawson, U.S.A.; T. Ogawa,

**Three members in Sweden, 1910**

Lady R. McRobert (Miss Workman), P. D. Quensel and W. G. Miller

Japan; J. J. Sederholm, Finland; A. Strahan, England; and others have promised to take part in the discussion or to present papers.

Topic No. 6.—To what extent was the Ice Age broken by Interglacial Periods?—Messrs. T. W. E. David, Australia; H. L. Fairchild, U.S.A.; G. W. Lamplugh, England; W. Lozinski, Austria; A. Penck, Germany; F. B. Taylor, U.S.A.; Warren Upham, U.S.A.; W. Wolff, Germany; and others have promised to take part in the discussion or to present papers.

Topic No. 7.—The Physical and Faunal Characteristics of the Paleozoic Seas, with Reference to the Value of the Recurrence of Seas in Establishing Geological Systems.—Messrs. Chas. Barrois, France; T. C. Chamberlain, U.S.A.; Chas. Schuchert, U.S.A.; C. D. Walcott, U.S.A.; and others have promised to take part in the discussion or to present papers.

Miscellaneous.—In addition to papers on the topics mentioned, contributions on other subjects of interest have been received from: Messrs. L. E. Gentil, France; C. N. Gould, U.S.A.; C. R. Keyes, U.S.A.; J. Samojloff, Russia; Bailey Willis, U.S.A.; and others.

## Proposals.

The Phosphate Resources of the World.—A proposal has been received from Prof. J. Samojloff, of Moscow, Russia, suggesting the world's phosphate resources as a timely subject for the consideration of the Thirteenth International Geological Congress.

The Fractures of the Earth's Crust.—Regarding the proposal made at the Eleventh Session of the International Geological Congress by William H. Hobbs, and which was referred to the Executive Committee of the Twelfth Session, the Executive Committee will report to the Council of the Congress as follows:

"The Executive Committee regret that, owing to the demands made upon their time in connection with the preparation of the extended series of excursions arranged for the Twelfth International Geological Congress, as well as in the publication of the Monograph on the Coal Resources of the World, they have been unable to undertake the preparation of an additional Monograph dealing with the fractures of the Earth's Crust as suggested by the Eleventh Session of the International Geological Congress. The Committee would, therefore, respectfully request that this task be transmitted to the Executive Committee of the Thirteenth International Geological Congress."

## Reports of Committees.

Reports will be presented at the Twelfth Session of the International Geological Congress from the following Committees:

1.—International Glacier Committee.—Elected in 1894 to encourage and advance studies of the size and variations of glaciers.

2.—Committee of the International Geological Map of Europe.—This committee since the Congress at Stockholm, has decided to publish a map of the world on a convenient scale, and to add to the number of the Committee by inviting representatives from non-European countries.

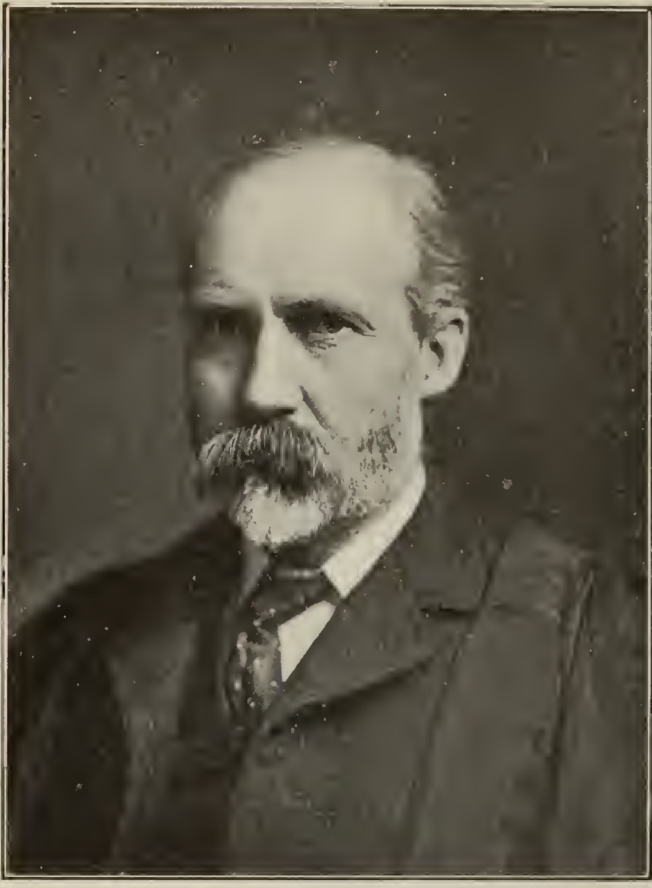
3.—Palaeontologia Universalis Committee.—An International Committee formed in 1900 to study the proposition of Mr. Oehlert regarding the reproduction by photographic processes of a series of type fossils.

4.—Spendiarow Prize Committee.—Charged with the award at each Session of the interest from a sum of 4,000 roubles donated in 1897 by Mr. Spendiarow, of Russia, for the most important geological work on a subject proposed by the Committee, that has been accomplished by an individual subsequent to the last Session.

5.—Stratigraphical Lexicon Committee.—Elected to carry out the proposal of Mr. Waagen regarding the publication of a stratigraphical lexicon.

*Chairman, Finance Committee*

**G. G. S. Lindsey, K.C.**



*Chairman Toronto Local Committee*

**Dr. A. P. Coleman**

**Professor of Geology, University of Toronto**

*Secretary Toronto Local Committee*

**Dr. W. A. Parks**

**Professor of Geology, University of Toronto**

**J. B. Tyrrell**

**Mining Engineer and Geologist, Toronto**

**Dr. T. L. Walker**

**Professor of Mineralogy and Petrography, University of Toronto**

**W. G. Miller,**

**Provincial Geologist of Ontario**

**Cyril W. Knight**

**Assistant Provincial Geologist, Ontario**

6.—Committee on Valuation of Iron Ore Resources. —To carry out and complete, according to a uniform method, the valuation of the world's iron ore resources, principally from an economic point of view.

7.—Committee on Institute for Study of Volcanoes. —Elected to consider the proposal of Mr. E. Friedlander, regarding the establishment of an Institute for the study of volcanoes.

8.—Fossil Man Committee.—Elected to examine the proposal of Mr. N. O. Holst regarding the election of a Committee for the study of fossil man and for presenting a programme at the next Congress.

**A. A. Cole,**

**Mining Engineer T. & N. O. Railway**

**A. G. Burrows**

**Geologist, Bureau of Mines, Ontario**

# SOME AMERICAN DELEGATES

Wm. H. Hobbs
University of Michigan

James F. Kemp, Columbia University

Dr. F. L. Ransome
U. S. Geological Survey

Charles D. Walcott, Smithsonian Institution

# PRODUCTION OF GOLD AND SILVER*

By Bedford McNeill.

The outstanding feature of progress for the last 33 years is, in my opinion, to be found in the enormous extension of mining, and the consequent corresponding increase in the production of the metals. Especially has the rate been accelerated during the past 10 years. I have prepared a table (see below) showing the World's production of the metals during the years 1889, 1891, 1901 and 1911.

**Increase of World's Production of Metals.**

| | 1899. Tons. | 1891. Tons. | 1901. Tons. | 1911. Tons. | Pctge Inc. for ten years ending 1911. |
|---|---|---|---|---|---|
| Pig Iron .. | ... | ... | 41,000,000 | 65,000,000 | 58 |
| Copper .. | 261,205 | 279,391 | 526.000 | 884.000 | 68 |
| Zinc .. .. | 329,600 | 356,200 | 500,000 | 900.000 | 80 |
| Lead .. .. | 540,200 | 589,000 | 850,000 | 1,100,000 | 29 |
| Tin .... .. | 55,400 | 59,500 | 88.000 | 116.000 | 32 |
| Nickel ... | 1,800 | 4,700 | 9,000 | 24.000 | 144 |
| Aluminium. | 70 | 328 | 7,500 | 46,000 | 513 |
| Mercury . | 3,700 | 3,700 | 3,000 | 4.000 | 33 |
| Silver .... | 4,100 | 4,700 | 5.300 | 7,500 | 41 |
| Gold ..... | ... | ... | 380 | 680 | 79 |
| Antimony . | ... | ... | 10,000 | 23,000 | 130 |

It is particularly the comparison between 1901 and 1911, say only ten years, to which I would direct your attention.

In no instance for the latter year is the increased production less than 29 per cent., and that is lead; copper and zinc increase 68 per cent. and 80 per cent. respectively; antimony 130 per cent.; nickel 144 per cent.; and with aluminium the production is multiplied no less than five times.

### Some Points Concerning the Relationship Between Gold and Silver.

The production of silver in 1901 was 5,300 tons, in 1911 it was 7,500 tons, the increase being 41 per cent. In the case of gold, the production in 1901 was 380 tons; in 1911, 680 tons; an increase of 79 per cent. It may be mentioned incidentally, that at the Royal Mint, during the year 1911, the gold dealt with was no less a quantity than 442 1-10 tons (avoirdupois).

### Gold.

Taking gold first, for the 108 years from 1493 to 1600, the average annual production was a little under a quarter of a million ounces. Taking the next 100 years, from 1601 to 1700, this figure approximated to a little less than one-third of a million ounces; for the next 60 years, 1701 to 1760, the output approximated to two-thirds of a million ounces. From the earliest date (1493) until 1840, there is only a gradual rise in production, but from 1841 onwards, the increase markedly sets in.

The discovery of gold in California was in 1848, and in Australia in 1851, and the effect of these two discoveries is shown in the output for next 40 years.

From 1851 to 1860 the average annual output was 6.4 million ounces.

From 1861 to 1870 the average annual output was 6.1 million ounces.

From 1871 to 1880 the average annual output was 5.6 million ounces.

From 1871 to 1880 the average annual output was 5.1 million ounces.

This latter date brings us to the starting of the Transvaal output in 1889, which owes so much to the simultaneous successful application of the cyanide process. We now get an enormous acceleration in output, and in 1911 the total output reported for the world was 22½ million ounces.

In other words, the world's present average production in one year is now equal to more than the total production for the 60 years preceding the year 1700.

Another way of bringing the gold production vividly before you is the statement that it is estimated that 653 millions sterling was added to the world's stock of gold for the 358 years from 1493 to 1850, whereas for the 11 years alone of this present century, that figure of 653 millions sterling has already been exceeded by the output of 867 millions sterling. Or again, there has been added to the world's stock of gold during the last 15 years a quantity greater than the total amount previously known to exist in the civilized world.

Before I leave the figures of the production of gold, I should like to allude to a remarkable feature, namely, its absorption and disappearance in India. Sir James Wilson, K.C.S.I., has recently published some interesting figures bearing upon this. For the ten years 1891 to 1900, the average annual absorption was 2.8 millions sterling. For the ten years 1901 to 1910 this figure became 8.2 millions sterling. In the year 1911 this absorption is given as 18½ millions sterling, and so recently as January last, Sir Edward H. Holden, Bart., estimated that during this present year, 1913, the probability is that the gold sent to India will be nearer 30 millions sterling.

In Egypt, too, there is a similar, though smaller, absorption of gold taking place. For the year 1910 this figure was given as six millions sterling. Lord Cromer, as far back at 1907, gave some Egyptian instances of hoarding gold. He says:

"A little while ago I heard of an Egyptian gentleman who died leaving a fortune of £80,000, the whole of which was in gold coin in his cellars. Then, again, I heard of a substantial yeoman who bought a property for £25,000. Half an hour after the contract was signed he appeared with a train of donkeys bearing on their backs the money, which had been buried in his garden. I hear that on the occasion of a fire in a provincial town no less than £5,000 was found hidden in earthen pots. I could multiply instances of this sort. There can be no doubt that the practice of hoarding is carried on to an excessive degree."

It is most extraordinary that the gold which is produced under circumstances demanding the highest technical skill, and in the obtaining of which the greatest care is lavished, and for which so many risk so much, should be destined ultimately to be buried and hidden out of sight, and, as far as we can judge, ruled out of any economic calculations, at any rate for the time being.

I need not remind you that the use of gold in a civilized community is not merely as it were for itself, but as serving the foundation for an enormous superstructure of credit; and unless, therefore, this absorption of

*Extracts from Presidential address, Institution of Mining and Metallurgy, March 13, 1913.

gold can be controlled or directed into channels in accordance with modern conditions, the embarrassment of the more civilized communities, as we regard ourselves, is going, I fear, to become more and more accentuated.

It is only fair to mention there are some who argue that this disappearance of gold is the least of several evils, and if it did not so disappear much greater troubles would ensue.

The question is, "Will the absorption of gold displace the absorption of silver in India?" which latter has been calculated by Sir James Wilson as totaling 423 millions sterling for the 70 years ending 1910. Will India continue to absorb silver? One can hardly think that it can absorb both gold and silver, and if India does not absorb silver, what is to be the result? What will be the outcome if the enormous population of India—who have already proved that they are unable to withstand the fascination of "hoarding"—be still further tempted.

### Silver.

In connection with silver there are three aspects to consider:

Firstly—The weight of silver produced;

Secondly—The ratio of that weight to the weight of gold produced; and,

Thirdly—The value of the silver as compared with the value of the gold produced.

Now, firstly, as to the weight of silver produced.

Commencing with the ten years 1801 to 1810 we had an average annual production of 29 million ounces. This figure dropped to 15 million ounces 1821 to 1830. Then, the successive figures are:

| Period of Time. | Average Annual Production. |
|---|---|
| 1831 to 1840 | 19 million ounces. |
| 1841 to 1850 | 25 million ounces. |
| 1851 to 1860 | 29 million ounces. |
| 1861 to 1870 | 39 million ounces. |
| 1871 to 1880 | 71 million ounces. |
| 1881 to 1890 | 100 million ounces. |
| 1891 to 1900 | 162 million ounces. |
| 1901 to 1910 | 182 million ounces. |
| 1911 | 252 million ounces. |

It is very remarkable that for a period of ten years (1901-1910) the weight of silver produced should have been maintained at a ratio as regards gold of 10 to 1, and this notwithstanding the great differences of locality and of the conditions under which the two metals were produced.

Secondly, as regards the ratio of the weight of silver produced as compared with the weight of gold produced.

Commencing with the period:

| Period. | Times as much weight of silver produced as compared with weight of gold produced. |
|---|---|
| 1801 to 1810 | 50.9 |
| 1811 to 1820 | 46.0 |
| 1821 to 1830 | 32.6 |
| 1831 to 1840 | 29.2 |
| 1841 to 1850 | 14.0 |
| 1851 to 1860 | 4.5 |
| 1861 to 1870 | 6.4 |
| 1871 to 1880 | 12.7 |
| 1881 to 1890 | 19.8 |
| 1891 to 1900 | 15.9 |
| 1901 to 1910 | 10.0 |
| 1911 | 11.2 |

Example—From 1801 to 1810 the production of silver was 50.9 times that, by weight, of gold.

In the ten years. 1851 to 1860, the discoveries of gold in California and Australia, as I have already pointed out, added to the gold production without any corresponding increase in silver, which for 1851-1860 fell to 4½ times the weight of gold. As between 1861 and 1911 the silver production varied by weight from 6.4 to 19.8. The production of silver for the year 1911 being by weight 11.2 times as much as gold.

Thirdly, as to the value of the silver produced as compared with the value of the gold produced, and for the same periods.

I have endeavored to discover as to how and when the ratio of value between gold and silver commenced, and as to what was its origin. Since the year 1884, I have been closely in touch with silver, and have watched its fluctuations daily. Silver to-day is enormously depreciated in value when compared with gold, but it was not always so. At one time there is a great probability that silver was the more valuable of the two.

Starting A.D. 1250, when 10.9 ounces of silver were exchangeable for 1 ounce of gold, we come down to 1911, when 38 ounces were required, and silver was 2s. 0½d. per ounce; the ratio for 1912 has slightly diminished, 1 ounce of gold requiring 33.3 ounces of silver to purchase it, the price being, say 2s. 4d. per ounce.

To about the year 1840, the gold produced in the world would only have purchased one-half of the amount of silver produced. In 1841 an increase of gold production commenced three times that of the previous ten years, and for the first time silver is more than balanced by gold. For the next period, 1851 to 1860, the gold production makes another leap of three times the previous production, the ratio of gold to silver being 15 to 1. The production of silver rises, until for the period 1881 to 1890 the silver was practically equal to the amount represented by the gold production multiplied by the existing value ratio.

This will be clear to you if we take for example, the ten years, 1881-1890, during which period the production of gold was 5.1 million ounces. The production of silver was 100 million ounces, that is to say, 20 times the amount by weight. The ratio of value for the same period was 19.8 (nearly 20), so that the 5.1 million ounces of gold were just balanced by the 100 million ounces of silver. Once, however, we leave the period ending 1890, we never again get the same conditions. As you already know, the production of gold has been unprecedented, and similarly so has that of silver. For the ten years ending 1900, the gold produced was equivalent to 309 million ounces of silver; for the ten years ending 1910, it would have purchased 657 million ounces of silver. For 1911, at the ratio of 38 to 1, the gold produced would have purchased no less than 855 million ounces of silver.

### Stocks of Metal.

In considering the foregoing figures, we have to take care that we do not lose sight of the cumulative effect of the world's stocks of the two metals, and it is to this aspect of stocks of metal I want to direct your attention for a few minutes.

A fact that has always to be remembered when we are considering gold, is the excessive care taken on every hand to prevent loss. The result is that gold stands pre-eminent as regards its increasing stock, and, although a part is utilized in the Arts (estimated by Dr. Soetbeer at 4,000,000 ounces per annum), this remains generally in such a shape that it can be re-melted and quickly put into the form of bullion again.

**The Relative Production of Gold and Silver.**

| Period. | Number of Years. | Gold: Millions of oz. | Gold: Value in millions. £ | Silver: Millions of oz. | Silver: Value in millions. £ |
|---|---|---|---|---|---|
| 1493-1660 | 168 | 41 | 173 | 1,490 | 514 |
| 1661-1850 | 190 | 113 | 480 | 3,320 | 952 |
| 1851-1900 | 50 | 334 | 1,400 | 4,010 | 750 |
| 1901-1911 | 11 | 205½ | 867 | 2,062 | 226 |
| | 419 | 693½ | 2,920 | 10,882 | 2,442 |

The total figures are not very dissimilar, namely, gold 2,920 millions sterling and silver 2,442 millions sterling, but this is explained when we remember the measurement of value, by the fixed value of gold. The total world's production of silver from the discovery of America, say—400 years ago, is estimated roundly to have been nearly 11,000 million ounces, and there was, of course, a large quantity of silver in the world before then. Taking the present world's stock, therefore, as being 12,000 million ounces, we have a value at its present price of, say, 1,200 millions sterling, more than one-half of which has been added to the world's stock of silver during the last 60 years.

**The Future.**

We should all like to know whether the present output of gold and silver will be maintained.

As regards the present, the large producers of gold are: The Transvaal, United States of America, Australasia, Mexico, Russia.

The large producers of silver are: Mexico, United States of America, Canada, Australasia.

Taking the world's total production as 100, I have worked out the annual percentage production of each of the above countries for the ten years ending 1911 (see following table). No accurate figures are yet available, but it is estimated that so far as gold is concerned the total production exceeded 25 million ounces, which is an increase over 1911. With regard to silver, the only estimate that I have seen is that the production for 1912 could be considered as equal to 1911.

It will be seen that the Transvaal has maintained its gold production, and in a lesser degree Mexico, but the United States and Russia are barely holding their own, whilst Australasia shows a falling off which has been continuous for the last ten years.

The question is: Will the ratio of production ruling for 1911 be maintained? The answer is to be found in giving a positive value to the following factors.

Against—We have the rise of cost of materials and labor acting as an automatic check on any further increase of production.

For—We have (1) the possible discovery of new gold fields; (2) new processes giving increased extraction, but for which new processes there is less and less scope; (3) diminished cost owing to improved mechanical means of handling tonnage. South Africa has shown us what can be done by the employment of huge amounts of capital, combined with competent technical and thorough business management.

As regards silver, which is also based upon the foregoing table, interest centres mainly in Canada.

PERCENTAGE OUTPUT OF GOLD AND SILVER PRODUCED 1902-1911

| Country | 1902 | | 1903 | | 1904 | | 1905 | | 1906 | | 1907 | | 1908 | | 1909 | | 1910 | | 1911 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver |
| Transvaal | 11.8 | — | 18.6 | 0.3 | 22.4 | 0.3 | 26.6 | 0.3 | 29.8 | 0.3 | 32.0 | 0.4 | 32.8 | 0.6 | 32.8 | 0.5 | 34.3 | 0.4 | 36.5 | 0.4 |
| United States | 27.1 | 33.8 | 22.3 | 31.4 | 23.1 | 31.7 | 23.2 | 31.0 | 23.4 | 30.6 | 21.7 | 30.8 | 21.4 | 24.7 | 21.7 | 24.1 | 21.2 | 24.0 | 20.6 | 22.9 |
| Australasia | 27.1 | 5.9 | 27.0 | 6.9 | 25.0 | 8.1 | 22.6 | 7.9 | 20.5 | 7.4 | 18.2 | 9.5 | 16.5 | 8.1 | 15.5 | 7.0 | 14.4 | 6.6 | 13.0 | 6.8 |
| Mexico | 3.5 | 35.2 | 3.5 | 39.2 | 3.7 | 36.8 | 4.3 | 35.9 | 4.2 | 37.0 | 4.5 | 33.3 | 4.7 | 34.2 | 4.9 | 32.0 | 5.0 | 32.6 | 6.3 | 34.6 |
| Russia | 8.3 | — | 7.6 | — | 7.1 | — | 5.8 | — | 5.6 | — | 6.4 | — | 6.9 | — | 7.0 | — | 8.0 | 0.1 | 5.3 | 0.1 |
| Rhodesia | 1.4 | — | 1.3 | — | 1.4 | — | 1.9 | — | 2.4 | — | 2.6 | — | 2.8 | — | 2.8 | — | 2.8 | — | 2.8 | — |
| India | 3.4 | — | 3.4 | — | 3.3 | — | 3.2 | — | 2.7 | — | 2.5 | — | 2.4 | — | 2.6 | — | 2.4 | — | 2.3 | — |
| Canada | 7.0 | 2.7 | 5.7 | 1.8 | 4.7 | 2.0 | 3.8 | 3.3 | 2.8 | 4.7 | 2.0 | 7.0 | 2.2 | 10.4 | 2.0 | 12.1 | 2.2 | 13.6 | 2.1 | 13.3 |
| | 89.6 | 77.6 | 89.4 | 79.6 | 90.7 | 78.9 | 91.4 | 78.4 | 91.4 | 80.0 | 89.9 | 81.0 | 89.7 | 78.0 | 89.3 | 75.7 | 90.3 | 77.3 | 88.9 | 78.1 |
| Other countries | 10.4 | 22.4 | 10.6 | 20.4 | 9.3 | 21.1 | 8.6 | 21.6 | 8.6 | 20.0 | 10.1 | 19.0 | 10.3 | 22.0 | 10.7 | 24.3 | 9.7 | 22.7 | 11.1 | 21.9 |
| World's Total Production | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.00 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

# U. S. MINE RESCUE CAR IN LAKE SUPERIOR DISTRICT

By P. B. McDonald.

Two years ago a mine fire occurred in the Hartford mine of the Republic Iron and Steel Co, at Negaunee, Mich., and seven miners were suffocated. It was realized that had oxygen helmets and pulmotors been available the men might have been saved, and mining companies, both in the copper and iron regions became aroused over first aid and mine rescue work. Previously the Lake Superior mines had been considered reasonably safe, as comparisons had been made with the coal mines, where so many fatal accidents occur. The Cleveland-Cliffs Iron Co. led the way in rescue work, by purchasing oxygen helmets and pulmotors, and training first aid and rescue crews at each of its mines; the company later held contests and exhibitions at its headquarters in Ishpeming, where prizes were distributed to the teams showing greatest proficiency. Other companies have followed the lead of the Cleveland-Cliff Co., even to the creation of a safety inspector, whose sole duty is to visit his company's mines and report machinery and working places liable to be dangerous.

A petition was then circulated in the mining towns and the signatures of thousands of miners obtained, asking the Government that one of the Rescue cars of the Bureau of Mines be stationed in the Lake Superior district. This request was complied with, and U. S. Rescue Car No. 8, the only one assigned to a metal mining region, was sent to Ironwood, Mich., as a headquarters. The car is fully equipped with all necessary apparatus for use in mine fires, accidents, etc., including oxygen helmets and pulmotors, and is manned by three Government experts. The car is ready at any minute to be taken to the scene of a mine catastrophe, where the crew will co-operate with the company in saving life. In addition the car travels around the different iron and copper districts, and the crew gives instructions and lectures to the miners and mine officials, spending several weeks in each place.

The car was recently at Ishpeming, on the Marquette range. At this place the Oliver Iron Mining Co. gave the use of an old building for experimental purposes; a smudge was built in the stove, and the building filled with smoke, so that a man could see only a few feet ahead. Then men were sent in fitted with oxygen helmets, and remained for an hour, during which they climbed ladders, sawed timbers, and operated a rock drill on a piece of diorite taken in for the purpose.

The pulmotors are used to resuscitate persons overcome by smoke, gases, electricity, or water; pure air is forced into the lungs and breathing automatically stimulated. The results obtained with the pulmotor on persons apparently dead are remarkable. In first aid demonstrations, the miners are instructed how to tie up an artery to stop the flow of blood, place splints on a broken arm or leg, make a stretcher out of such materials as a pair of overalls and two long drill-steels, etc.

Following the visits of the Rescue Car in nearly every district, the mine officials of the different companies have co-operated to form a Miners' Safety Club, which meets at intervals to discuss safety and rescue work.

# METHODS OF MINING AT COBALT

By Reginald E. Hore.

The general method of mining high grade ore in the early days was by open cuts. Rock on one side of the vein was broken and removed, and then the vein matter was picked off the wall and bagged. From open cuts 50 or 100 feet deep, several million ounces of silver was taken in this way before more systematic mining was undertaken.

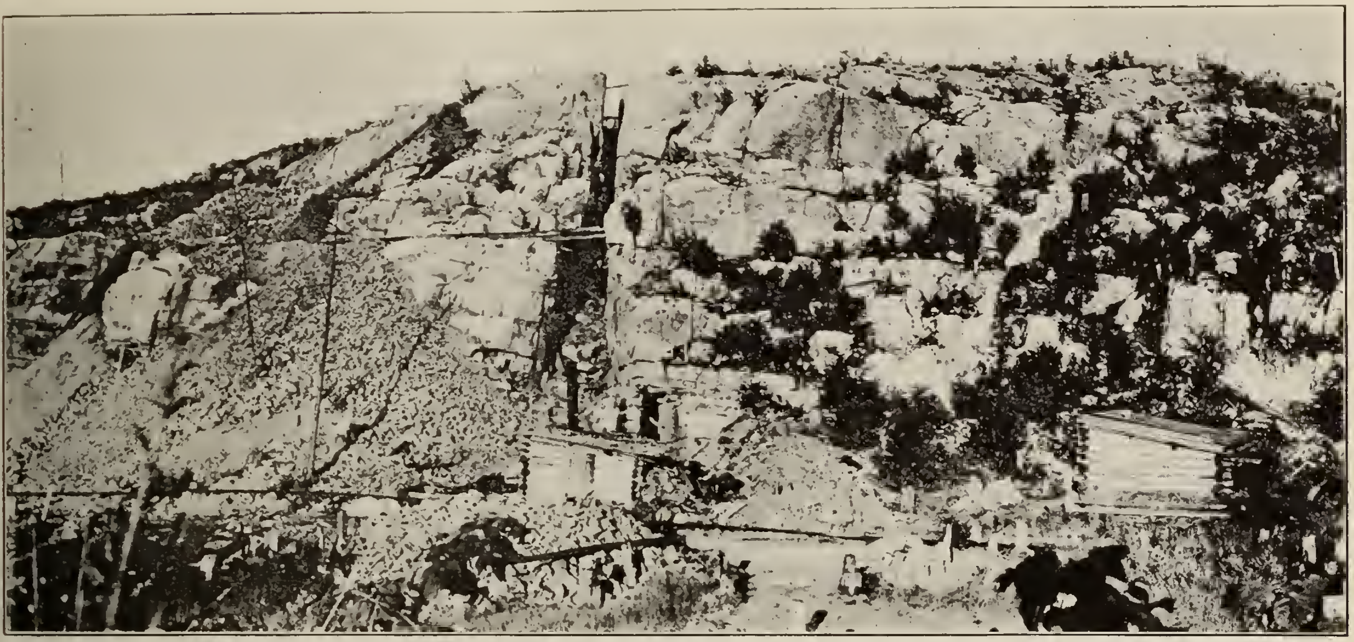
The deposits having proven to be of great value it might have been expected that ordinary development shafts and drifts would have been started, but at many mines this was not done for some time. When such work was finally done and overhand stoping commenced, it was still common practice to leave the vein on one wall and bag only the ore taken off after removing the broken rock. Much fine ore became mixed with the rock which was piled on the dumps. Later more attention was given to this lower grade material, and when numerous concentrators had been built for its treatment, the method of mining and handling ore was naturally improved.

In almost all cases the present practice in developing ore is to sink vertical shafts on the vein and drive drifts at short intervals, 50 or 75 feet in many mines, and usually less than 100 feet. Other veins are reached by cross-cuts and developed by winzes and drifts in a similar manner. At most mines there is a central hoisting shaft where all the ore from several veins is raised to the surface.

Instead of leaving the vein on the wall, it is in most mines now the practice to keep the vein well within the working face. The rock on each side for a few feet, and in many cases for several feet, usually contains enough silver to pay for milling. In some mines care is taken to keep the high grade vein matter from mixing with the broken rock. It is picked out and bagged in the mine. In other mines the practice is to do no sorting whatever underground. All is allowed to mix and is raised to surface, where it is washed, screened and hand picked. The undersize is jigged or shipped direct to the smelter.

In stoping the ore some mines use a shrinkage system. The ore is broken down onto the lagging and just enough drawn off to give room for the miners. In this way a block of ore is stoped from one level to another, and there is, consequently, in a stope just finished about 60 per cent. of the broken ore still underground.

**Open Cut on main vein, O'Brien Mine, Cobalt**



Early workings on Little Silver vein, Nipissing Mine

Silver vein, O'Brien Mine

In other mines the practice is to put in stulls and lagging at short intervals in the stope, and then there is often a comparatively small amount of broken ore necessarily present in a stope at any one time. This is done in mines where the practice is to raise the ore as soon as possible after it is broken.

In one mine, the Crown Reserve, square sets are used, but so far as I am aware, this method of timbering is not used in any other. Good examples of the shrinkage system are the Nipissing and Coniagas mines. The practice of the Nipissing is briefly as follows:

### Method of Mining at Nipissing Mine.

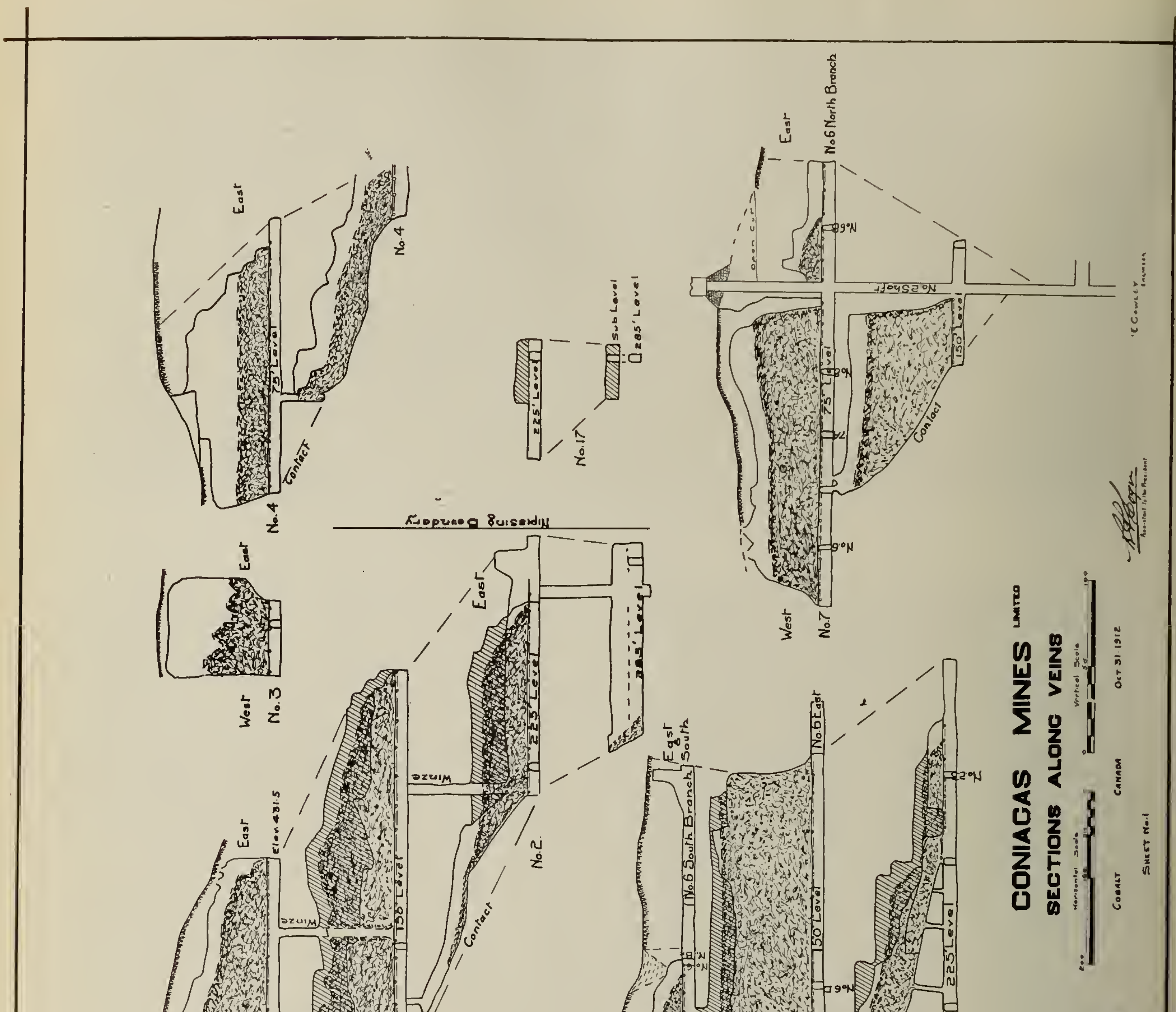
In mining a block of ore drifts are commonly run 14 feet high and 5 feet wide. If the walls are good milling rock, or if there are two or more veins close together, the drifts are carried much wider—in some cases 12 feet. The veins are kept well within the breast.

The drilling for the whole 14 feet is done from one set up, so each set up is for an advance of 5 or 6 feet with a height of 14 feet and a width of 5 to 12 feet. A cut 8 feet high is taken 5 or 6 feet in advance of the remaining 6 feet, which is drilled by uppers.

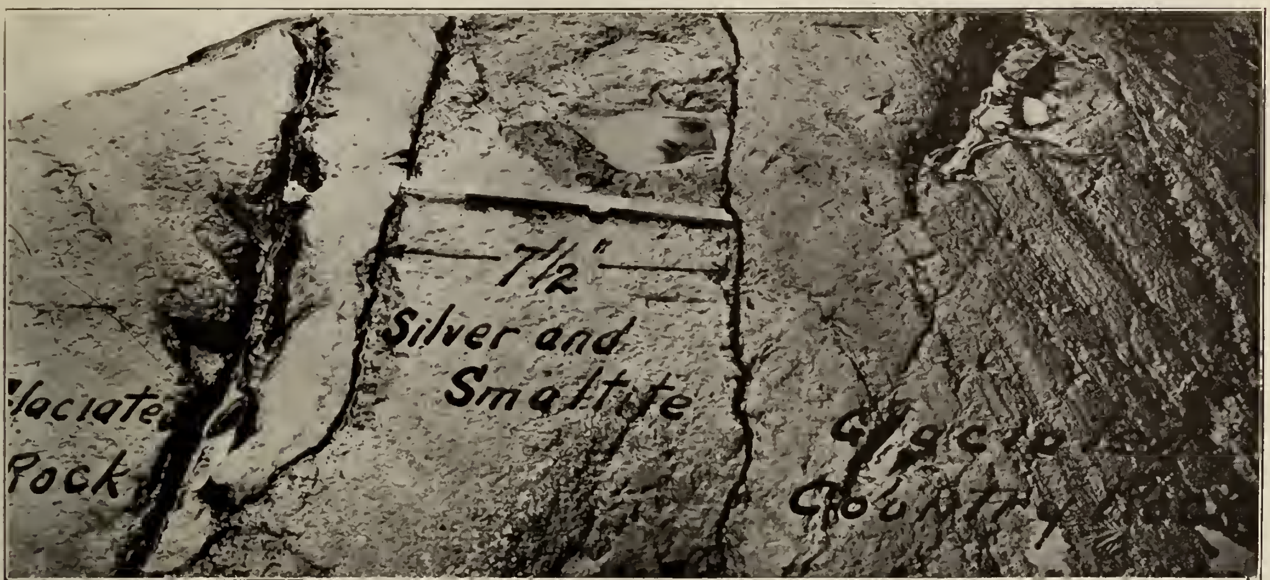
The drift is now timbered. The level is protected by a lagging of poles laid on caps supported by posts. Chutes are built at intervals of about 25 feet.

Before stoping a large block, raises are put through to the next level. These are cut by two men using small stoping drills. A manway is timbered off and the remainder of the raise is filled with ore as it is broken. The miners work on a platform which protects the manway and extends across the broken ore. To keep the desired working space ore is drawn off from a chute at the bottom of the raise. This chute is afterwards used for ore from stoping.

When the raise is completed it is used to provide a stoping face and the ore is broken on either side. The raise provides ventilation, and is used to lower the steel and as manway. The high grade and low grade ore




Section showing method of developing and mining veins at Coniagas Mine.




Rich silver vein and glaciated country rock, Lawson Mine, La Rose Mines, Cobalt

are not kept separate, but all is allowed to lie as it falls when broken. Enough is drawn off to provide space for the miners. The cars are taken to surface on a cage,

### Method of Mining at Coniagas Mine.

The methods of developing and mining at the Coniagas are similar to those at Nipissing, but some variations may be noted. Drifts are run 8 feet high and later enlarged by a cutting-out drift, giving 8 feet additional height. The lagging is supported by stulls set in hitches. Where the drift is wide posts are used to support stulls in the middle. Chutes are built at intervals of about 25 feet.

When the timber is ready, stoping is begun by breaking some ore carefully onto the lagging, and then continued by the shrinkage system. To avoid pot-holing and sledging of large chunks of rock, care is taken to break the rock comparatively small. Heavy charges are not used.

Considerable high grade ore is picked out by sorters underground. In the drift-stopes a sorter looks over the ore as it is loaded into cars and bags the high grade. In the stopes there are no sorters, but the miners, without making very careful examination, pick out considerable high grade. While at the Nipissing all the ore is sorted at the surface, a very considerable percentage of the Coniagas high grade ore is bagged underground, and is brought to the surface ready for shipment to the smelter.

The Coniagas does not use a cage in hoisting. The ore is trammed to the shaft and emptied into pockets. Thence it is drawn off by chutes to a specially designed skip. The skip dumps automatically at surface over a grizzly to a chute down which the ore runs to the mill bin. The ore is crushed before another product is taken, and mine fines are treated together with fines from the crusher.

The Coniagas uses two man drills in stoping as well as in sinking and drifting. The drill used is the Redington, designed by Mr. John Redington and manufactured on the property.

Silver vein, Nipissing Mine

# APPLICATION OF GENETIC THEORIES TO THE SEARCH FOR ORE†

By George E. Collins.

The science of economic geology advances in bounds only to overreach itself and fall back; but it never recedes quite to the starting place. In each of the fashionable theories which from time to time spring up, there is a kernel of solid truth, which remains as a permanent addition to the stock of human knowledge, after the husks have been blown away by the searching blast of criticism.

The reasons for the failure, in practice, of so many deductions based upon generally accepted theories of ore deposition and local enrichment, have been clearly and fairly stated by R. A. F. Penrose in a recent paper entitled "Some Causes of Ore Shoots," published in Economic Geology. I quote from the paper the following paragraphs:

Page 100. The great difficulty in classifying ore shoots is that many totally different causes have often combined to produce any one shoot, and the evidence of some of these may have been much obscured or even obliterated since that time, so that the determination of just what cause has been uppermost in influence is often impossible.

Page 131. The influences that may produce ore shoots do not necessarily do so. An ore shoot is the exception and not the rule, and even when apparently the most favourable combination of influences exists, there may be no ore shoots. Moreover, the causes that have produced a shoot in one region may have no such effect in another region, or in another deposit in the same region, or perhaps in another place in the same ore deposit.

As a matter of fact, most of these influences seem to be practically without effect in far more cases than they have effect, and in some cases they have actually been injurious to the quantity, or quality, or both, of the ore.

Many of us used to criticize the geologists, and in particular those of the United States Geological Survey, for publishing obituaries; and to suggest t' they were to blame for not being ready with an exhaustive study of a mining district until its deposits were worked out. Yet, if we cast aside the temptation to indulge in cheap sarcasm, how is the geologist to furnish a complete explanation of the facts, before the facts themselves have been laid bare? On reflection, we should admit that no final and convincing description of any mining district can ever be written, excepting as an obituary. The object of such work is to arrive at general truths which may ultimately be applied elsewhere; and in our hurry for something which the geologist cannot supply—reliable deductions as to the nature and form of ore bodies that the miner has not yet found—we rush him into furnishing descriptions of phenomena which we cannot recognize when we look for them, and hazarding opinions which too often prove unfounded. Yet the fault is not so much his as ours, who expect the impossible. The result is to confuse the popular mind; to discredit science herself, instead of the fallacies and half truths which are delivered in the name of science.

We must learn to ask at once less, and more, of the geologist. In new and partially opened districts, he can give us a useful and indeed essential aid—a study of the structural geology. He can read for us the relative ages of veins and rock formations; can assist us by collecting and correlating the data, many of which are unknown to or overlooked by the technical man who is most familiar with any given district; and can inform us what is known of ore occurrences elsewhere, where the conditions are sufficiently similar to suggest possible analogies in the deposits which result from the conditions. The less he ventures into the realm of concrete prediction, the better for his peace of mind, and for the progressive unfolding of correct scientific conceptions.

This groundwork or outline furnished, it remains for the miner to fill in the details. It is here that the role of intelligent hypothesis, based on sound scientific conceptions, and on detailed observations drawn from practice in comparable localities, comes in. There are only two ways of conducting mining exploration. The one is essentially empirical, prospecting by shafts and levels at regular distances on a plan adopted with a view to subsequent convenience in working; or by bore holes spaced at more or less regular intervals. This method, in its multitudinous ramifications is eminently suitable for regular veins or simple deposits. But just as we must be prepared in metallurgy to deal with increasingly complex and difficult ores, the simpler ones having been already taken care of by our predecessors, so in mining, the future belongs to the man who can find and extract the more irregular deposits; who can unravel the puzzling and intricate cases of complex faulting, and of devious ore channels. The mere mechanical problems incident to mining are so much child's play compared with these, and I cannot but think that eventually the honor, and remuneration, attending professional work will in greater measure be regulated by its difficulties, and the quality of the faculties which are necessary to cope with and overcome them.

It has long been a favourite doctrine of mine that the problems which require to be solved are often more difficult and intricate in a small mine than in a large one, and success is often due more directly to the degree of ability applied. In each case we have to proportion our means to the attainable ends. The successful solution in the large mine is frequently only the application of a simple method on a large scale, by multiplying units. As with smelting, the inherent difficulties are often removed by merely enlarging the scale of operation. From this reflection, which I believe is indisputable, I sometimes pass to the paradox that the remuneration for the work of mine management should be fixed in inverse proportion to the size of the mine.

But to return from this digression. In the development of irregular ore bodies, we must either adopt the same geometrical basis of exploration, which soon leads to bankruptcy, or else direct our exploration according to some working hypothesis. To "follow

*Proceedings of the Colorado Scientific Society, Vol. X.; extract from presidential address, published in Mining Science.

your ore" is an excellent maxim, when you have it; but it does not help very much when your ore is yet to be found. Hitherto, the work of hunting for ore has been left, as a rule, to the so-called "practical man." He also plans his work along the lines suggested by some hypothesis. The trouble is that, as has been pointed out by others, there is no theorist so wild or so inveterate as your "practical man;" none that rides his hobbies so hard or so far. What is needed is the trained mind, acquainted with the literature of ore deposits in various districts; able to observe from day to day all the facts that suggest similar conditions and possibly parallel results in his own, and familiar with all the various theories of ore deposition which are applicable to those conditions. Thus equipped, he is able to form rational hypotheses on which to base exploration, and to realize when the time has come to discard them and adopt others. In other words, the scientific miner of the future will proceed along much the same inductive lines as those which have laid the foundations and built the superstructure of all modern scientific progress; the only difference being that he cannot artificially create the conditions of each experiment, for which reason his progress must inevitably be far slower.

The detailed study of ore deposits, with reference to their origin and distribution, requires four qualifications: First, a thorough grasp of the fundamentals of physics and chemistry; second, a wide first-hand acquaintance with other occurrences elsewhere, for the purpose of comparison; third, a close and continuous study of the deposits under consideration, for the reason that much of the evidence bearing on the genesis of the deposit is removed as rapidly as it is exposed; fourth, and most important of all, imagination, by which alone the mind can conceive tentative hypotheses of origin, to be tested by the observed facts. I have said above that I believe the complete history of any mine cannot be adequately written until the mine has been worked out. To this I would add that it cannot be done without a dependable record of its characteristics as they unfold themselves.

An ore deposit is a palimpsest on which, throughout successive ages, various chemical and physical processes have traced their records. The most legible inscription on its surface may represent only the latest of the many influences which have contributed to the final result. By careful scrutiny we can sometimes discern, hidden perhaps in an obscure corner, traces of the half-obliterated hieroglyphics which record the earlier stages of its development.

In an examination of any such deposit, we can merely see what happens to be exposed in drifts, raises and so forth, at that particular moment. Even of these, only a small proportion, in most mines, is open for examination at any one time; and the openings themselves form only part of the total area. The visiting geologist or engineer therefore sees only a small fraction of the entire deposit, and it is natural enough that in many cases the really significant pieces of evidence escape him. The man who has the best opportunity, to study the deposit is he who is familiar with it throughout the entire period when it is being worked; who sees the freshly broken face of each drift, and the developments from day to day in every working place. A relatively less degree of ability so applied may be expected to yield greater results than an occasional brief visit from an eminent scientific authority. The greatest progress in the study of ore deposits may be looked for when these men become conversant with the fundamentals of economic geology; when the mine superintendent and the mine surveyor have been trained in the methods of the field geologist, to observe accurately and to record their observations.

Even now I do not believe for one moment that the men who do the actual work of underground mining are as unobservant or as incapable as one might suppose, judging from the comparative absence of mention of their observations in the modern literature of ore deposits. I prefer to conjecture that their work has somehow failed to become adequately recognized in the publications; and that many of the luminous observations recorded are really due to the careful study of some unnamed foreman or mine superintendent who conducted the distinguished visitor through the mine.

In the future scientific dealing with the origin of ore deposits, and particularly the localization of their richer portions, I believe that the work of the chronicler will be of equal dignity and importance with that of the official historian. I go further, and express the opinion that when more of our economic geologists take up the actual work of directing and planning underground mining operations, their opportunities for original observation will be improved, and the results will be careers of increased usefulness, and increased scientific progress.

Certainly there is no royal road to the discovery of ore bodies which do not crop out at surface. Yet the study of the subject is not without practical utility. It enables us to substitute intelligent underground prospecting for purely geometrical or empirical prospecting. Our ore bodies are not found, as a rule, where we look for them the first time, or the second; for, as Lindgren says, the shoots "often fail to materialize where in accordance with supposition they should do so." But as the result of a great deal of hard-earned experience I do not hesitate to assert that prospecting based on intelligent hypotheses succeeds far oftener than prospecting which is blind or based on unintelligent hypotheses. Further, the trained engineer, familiar with what is known already of the causes of the localization of ore, and its occurrence under widely different conditions in many districts, has a great advantage in finding ore over the ordinary uneducated tributer.

It has frequently occurred to me that, in discussing the origin of ore localizations containing the precious metals, and also compounds of the base metals, there has been some confusion of thought owing to failure to distinguish sufficiently between the causes which produced enrichments of gold, and those which produced ore bodies of the base metals. The same causes which produced the one by no means necessarily produced the other. In the case of the base metals, we are dealing with appreciable quantities which can be expressed in percentages; and their ores, if sufficiently plentiful to be considered ores at all, are at once visible. With the precious metals, on the other hand, and gold in particular, we have to deal with minute proportions, one two hundred and fortieth of 1 per cent. being a high grade ore—or quantities which, excepting for the relatively simple metallurgy of gold, could not be detected, much less worked. It is probable that other rare elements exist in common ores to at least an equal extent, the presence of which, owing to the absence of equally effective methods of assay, is never suspected. The gold in most ores, in fact, may from the standpoint of the chemist or the physicist be regarded as an insignificant and accidental impurity in the very ore bodies which derive their economic value from its presence.

The geologist who studies this subject has usually no personal knowledge or equipment for investigating at first-hand this most important factor in the distribution of ore values. He is dependent on the engineer or mine superintendent for information of this kind, which all engineers know is most difficult to ascertain precisely, even with close and prolonged study. How frequently it happens that, even after years of familiarity with the ores of a particular mine, with all the assistance afforded by thousands of assays, the engineer still knows little or nothing positive as to the conditions under which his precious metals occur, or the specific minerals with which they are associated. Indeed, we frequently know more, or rather imagine we know more, after the first week, than after the first year. Now, the unfortunate geologist is usually in the same position as we are after the first week: That is, he has absorbed a great many observations which have every merit, except that of being in accordance with the facts. He is necessarily dependent on the information he gets from the local operator, and the stream is no purer than its source. It is by no means true that even a man who is very familiar with a mine, necessarily knows the valuable ore by its appearance. The ore of some mines can be quite accurately graded by a person who is really familiar with them; in other cases it can never be accomplished.

As an aid to the discovery of ore shoots, nothing is so important as persistent sampling. By that I do not mean the systematic sampling employed to delimit and ascertain the value of ore bodies, the methods employed in which have been thoroughly worked out and described for several years past. I mean rather the kind of sampling which is employed—only not nearly so thoroughly as it should be—by the tributer in search of a "pitch." This kind of sampling is directed more to find where values are, than what they are; it tests every separate stringer, regardless of size and every novel vein material, however small in quantity. Its use reminds one of the children's game of "hide and seek," in that directly you get a good assay you may be "warm," for it proves that solutions carrying high values have been at work in that vicinity, and it is time to hunt for their channels. More and more, experience teaches me that this is the essential factor in prospecting. The mineralization being of the right character, there is always a fair chance of finding some place where its effects have been concentrated sufficiently to create commercial ore bodies. On the other hand, I have learnt to distrust the veins, however large or "well defined," which show no evidence somewhere or other of mineralization by solutions which were capable of depositing a workable grade of ore. Nearly every mining district contains plenty of such, which have every requisite for making good mines, excepting pay ore. There was a time when a fine appearing vein appealed to me in itself; and I recollect that at one time I used to suppose that in choosing a place to prospect, it was necessary to select "a fine, large, generous vein," so that if an ore body occurred in it, there would be plenty of space for a large one. I have grown out of all that. Granted the right kind of mineralizing solution, and a fissure, however small, the elements are there already. At some point shattering or faulting will have made spaces enough in which to deposit ore; or, if not, the mineralizers can usually eat out their own receptacle.

# SORTING, ROASTING AND SMELTING NICKEL-COPPER ORE, CANADIAN COPPER COMPANY

The Canadian Copper Company is at the present time mining ore at the Creighton, the Crean Hill and No. 2 mines. In 1912 the ore production was as follows:

| | |
|---|---|
| Creighton | 518,417 tons. |
| No. 2 | 66,371 tons. |
| Crean Hill | 33,506 tons. |

The hoisting, crushing and picking methods are the same at all the mines, and a description of the process at Creighton Mine will suffice for all.

The ore is hoisted in $2\frac{1}{2}$ ton skips by motor-driven hoisting engines. At the top of the rock house the skip dumps over a "grizzly" or screen, formed of rails spaced five inches apart. The fine ore is thus separated

General View of Smelter, Canadian Copper Co.

**Creighton Mine Buildings, Canadian Copper Co.**

from the coarse and falls into the fine ore bin. The coarse ore is fed into two crushers of the Blake type, 18 x 30, which break it into pieces approximately 2½ inches cube. The crushed ore passes through trommels pierced with ⅞ inch openings, which remove the fine ore. The coarse ore passes over picking belts, where any visible rock is sorted out by hand. Of 100 parts material hoisted, about 10 parts are removed on the belts as rock.

**Roasting.**—The coarse and fine ore are taken from the rock house on flat cars and removed to the roast yard at Copper Cliff. Here the ore is roasted in open heaps. A bed of cordwood is prepared, and on this the ore is placed in piles of about 2,000 tons, about six feet high. Fine ore, which is separated from the coarse at the rock houses, and which amounts to about 15 per cent. of the total ore, is used to cover the beds. The wood is fired and the piles allowed to burn under normal conditions for about three months. The sulphur, which in the green ore is 25 per cent., is thus

**No. 3 Mine Buildings, Canadian Copper Co.**

**Crean Hill Mine Buildings, Canadian Copper Co.**

reduced to 12 or 13 per cent., a corresponding oxidation of iron takes place, so that the roasted ore consists of a mixture of iron oxide with the sulphite minerals.

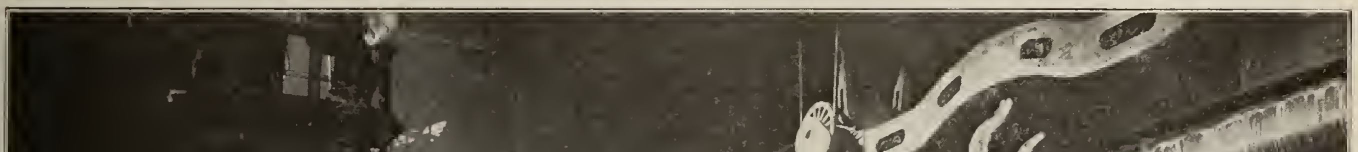
The roast ore is loaded into steel drop bottom cars, holding 50 tons, by a steam shovel. The roast ore is now taken to the smelter and dropped into bins behind the blast furnaces. These bins contain beside the roast ore, all the ore from Crean Hill, which is used as it comes from the mine, without roasting, together with quartz, limestone, coke, converter slag and other materials used in the smelting process. Quartz is used as a flux in the blast furnaces, to combine with the oxide of iron, produced both in the roasting and the blast furnace treatment of the ore. This quartz comes from the Company's quarry in the township of Dill, about twenty miles south-west of Sudbury. It is a

**Roast Yards, Canadian Copper Co.**

**Blast Furnace Charging Floor, Copper Cliff Smelter**

remarkably clean, massive quartzite, containing about 92 to 94 per cent. silica.

**Smelting.**—To understand the smelting operations, it must be premised that copper and nickel matte smelting is entirely opposite in its principle to the blast furnace treatment of iron ores. In the iron furnaces, the operation is conducted in a reducing atmosphere, with the intention of reducing all the iron present to metallic form, and preventing its passage into the slag. In copper and nickel smelting, on the other hand, the operation is conducted in a strongly oxidizing atmosphere, with the intention of driving as much as possible of the iron into the slag, and saving only the copper and nickel with sufficient sulphur to pre-



**Tapping Floor, Copper Cliff Smelter, Canadian Copper Co.**

**Basic Converter Plant, Canadian Copper Co.**

vent their oxidation. Copper and nickel combine with sulphur in the blast furnace to form what is known as matte. This matte contains iron in amounts which vary inversely with the amount of oxidation attained on the roast yard and in the blast furnace. If the ore is roasted to 10 per cent. sulphur, the furnace matte may contain 30 to 40 per cent. copper nickel, and from 40 to 30 per cent. of iron, while if the ore is roasted to about 14 per cent. sulphur, the furnace matte may contain only 10 to 20 per cent. copper nickel, with about 50 per cent. iron. It is evident that if the ore is poorly roasted, the oxidation attained in the blast furnace must be relatively greater than is necessary with well roasted ore. This furnace oxidation is attained by the addition of quartz in the blast furnace. This quartz prevents the rapid smelting of the ore, and by holding it in the blast furnace, under the influence of a powerful blast of air, allows the oxidation of about 50 per cent. of the sulphur and iron, contained in the roasted ore. The iron oxide formed on the roast yard and in the blast furnace, combines with the quartz to form a slag which contains about 55 per cent. iron

**Reverberatory Department, Copper Cliff Smelter**

oxide, in the form of silicate of iron. This silicate of iron can often be found in crystalline form on the slag dump.

Limestone is used as a flux only when the furnaces are in poor condition. The addition of a lime base to the slags lowers their melting point, and thus allows the cleaning of accretions from the sides of the blast furnace. In certain cases, when the ores are very rocky and particularly if much aluminium is present, the addition of a small amount of limestone to the charge is indicated.

The furnace charge is taken from the bins in trains of nine cars hauled by electric locomotives. These cars hold about two tons of ore. The first three cars contain coke, about 11 per cent. of the weight of the charge. This is dumped into the furnace by rolling the cars on their base, so that the coke is spilled over the side of each car into the furnace. The next car contains quartz, which is spread on top of the coke by moving the train along while the quartz is being dumped. In this way the quartz is placed next to the coke, and being thus strongly heated is in a position to combine with the iron which flows down over it from the melting ore.

The ore charge of three or four cars is dumped next above the quartz. The last car or cars may contain converter slag, scrap, or other smelter cleanings, and are dumped last.

The blast, which is introduced through 32 tuyeres near the bottom of the furnace, furnishes oxygen, not only for the combustion of the coke, but also for the combination with the sulphur and iron in the ore. The amount of air blown into each furnace is about 24,000 cubic feet per minute. Each furnace smelts about 300 tons of ore, or 400 tons charge in 24 hours. During this time it receives about 1,300 tons of air, so that the air blown into the furnace is about three times as much in weight as the solid charge.

There are five furnaces 17 feet long, and one furnace 21 feet long, having a total capacity of over 2,000 tons ore in 24 hours. The melted products flow continuously from the furnace into an oval brick-lined settler, 19 ft. 6 in. x 16 ft. x 5 ft. 6 in. In this settler the matte, which has specific gravity about 4.6 to 4.8, separates from the slag, which has specific gravity about 3.7. The slag runs continuously from the settler into 25 ton pots, which are taken to the dump. This slag contains about 33 per cent. silica and about 55 per cent. iron oxide. It carries off about 0.4 per cent. copper nickel. The matte is tapped from the bottom of the settler into eight ton pots and transferred to the converter building. This furnace matte contains about 6 per cent. copper, 16 per cent. nickel, 47 per cent. iron and 27 per cent sulphur. It is treated in the converter department by blowing air through it to convert the iron into iron oxide, which iron oxide, as fast as formed, unites with quartz or mine rock, which is placed in the converters as a flux. The continuous blowing of air through the matte, and the continuous removal of the iron in the shape of converter slag, removes the iron from the matte and leaves a final product containing about 80 per cent. copper nickel, with about 0.5 per cent. iron and 19 per cent. sulphur, which is known as Bessemer matte.

**Interior of Sub-Station, Copper Cliff Smelter, Canadian Copper Co.**

**The converters**, five of which are installed, are cylindrical iron vessels, 37 feet long by 10 feet diameter, lined with magnesia brick and capable of rotation on a horizontal axis. At the back of these converters is a row of tuyeres, 44 in number, and 1½ inches in diameter, through which air is blown into the molten matte at about ten pounds pressure. Each converter requires about 6,500 cubic feet of free air per minute. This air rapidly oxidizes the iron and sulphur in the matte, burning about 120 pounds iron per minute from iron sulphide to iron oxide, with a corresponding liberation of sulphur dioxide. The hot gases escape through

**Hydro-Electric Plant, High Falls, Canadian Copper Co.**

a six foot opening in the top of the converter. A slot shaped opening in the front of the converter allows the slag to be poured off as desired.

The conduct of the operation is as follows: The converter, being empty and heated by a previous charge, about 70 to 80 tons of matte is poured in with 5,000 or 6,000 pounds of dry crushed quartz. The converter is turned back and air blown in through the tuyeres. After an hour's blowing, the converter is turned down and slag poured off. From this time on, every forty minutes one pot of matte is added to the charge in the converter, with about 5,000 pounds of a mixture of quartz and waste mine rock. Air is blown through this for forty minutes. Slag is poured off and matte and flux added. In this way 400 to 500 tons matte may be put into the converter before the iron is eliminated, and a cast of 100 tons Bessemer matte obtained. This "blow," as one complete operation is termed, will last about 70 or 80 hours. The time depends on the grade of the matte put in the converter. Each ton of matte containing 22 per cent. copper nickel will produce about a ton of converter slag. The converter slag contains 28 per cent. silica and 62 per cent. iron oxide, with 2½ to 3 per cent. nickel. This slag is poured on a bed in the yard and sent back to the blast furnace, where its high percentage of iron oxide makes it useful as a flux. In passing through the blast furnace the copper nickel contents are very largely recovered.

The finished matte, which contains 25 per cent. copper. 55 per cent. nickel, 0.5 per cent. iron and 19 per cent. sulphur, is cast into slabs, broken by hand, loaded into box cars and shipped to the refineries in Bayonne, N.J.

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# NEW PLANT OF THE STEEL COMPANY OF CANADA AT HAMILTON, ONT.*

At Hamilton, Ont., the Steel Company of Canada, Ltd., recently has placed a new plant in operation consisting of a blooming mill, continuous billet mill and continuous rod and merchant bar mill, which combines all of the latest improvements in rolling mill design and operation. As a unit, it is claimed to reach the highest development of more recent steel rooling practice. The features of these works are summarized as follows:

Electrically-driven throughout.

Power is purchased from a hydro-electric plant, the current being transmitted a distance of nearly 40 miles.

The reversing blooming mill is motor-driven.

The motor-driven continuous billet mill consists of four stands, necessitating larger reduction for the four passes than is customary in mills of six and eight stands of rolls.

The combination continuous rod and merchant bar mill is the first of its type to be installed on the North American continent.

Equipment for cooling rods, whereby they are annealed and the formation of scale is reduced to the minimum.

Steel for this new plant is produced in six open-hearth furnaces, two of 80 tons, two of 35 tons and two of 25 tons capacity, the monthly output averaging approximately 15,000 tons. The two 80 ton furnaces have been added recently to meet the requirements of the new rolling mill and have been installed in an addition

*Extracts from an article published in Iron Trade Review, July 3, 1913.

to the existing open-hearth building. Hot metal is supplied by two blast furnaces, the open-hearth charges consisting of 55 per cent. of scrap and 45 per cent. of molten pig. Prior to the operation of the new plant, 6x6 inch ingots were cast, approximately 5 feet long, which were broken down in a roughing mill, this practice and the employment of small ingots, which were the size of large billets or small blooms, having entirely eliminated the blooming operation. The ingots for the new mill are 15x17 inches in section and weigh approximately 4,200 pounds.

The blooming and billet mills and the combined continuous rod and merchant bar mill are located in separate buildings, paralleling each other, and divided by a crane runway, extending at right angles to these structures, which commands the billet cooling bed, loading truck and the large conveyor for the continuous billet heating furnace for the rod and merchant bar mill. Both buildings are of steel construction, the one containing the blooming and billet mills being 60x475 feet and the rod and merchant mill 85x550 feet.

After casting, the ingots are conveyed from the open-hearth department over a standard gage track to one end of the blooming mill building, where the molds are stripped by a 75-ton, 63-foot span stripping crane, installed by the Alliance Machine Co., of Alliance, O. From the ingot mould cars the ingots are transferred to the soaking pits by a 10 ton soaking pit crane, installed by the Morgan Engineering Co., Alliance, O. The two soaking pit furnaces each have four holes, 5 feet x 8 feet 6 inches, which have a capacity of eight ingots each. These furnaces are built almost entirely above the floor level, permitting easy access for repairs. Producer gas is used for heating, this fuel being generated by four Morgan producers located in a separate building contiguous to the blooming and continuous billet mills. The covers of the soaking pit are hydraulically operated from a platform on a level with the tops of the furnace.

From the soaking pits the ingots are delivered by a crane to the approach table of the two-high, 34-inch, reversing, motor-driven blooming mill, which was designed by the Morgan Construction Co., and built at the Lloyd-Booth plant of the United Engineering and Foundry Co., Pittsburg. When breaking down ingots into blooms for the billet mill the steel is given 18 passes, but when breaking down for 6x6 inch blooms, the number of passes is reduced to 15. The blooming mill approach table is operated by a 30 horse power, direct current motor, and the two blooming mill tables are driven by 100 horse power motors. The side guards of the mill are hydraulically operated. In line with the blooming mill is the electrically operated 18 inch continuous billet mill, which consists of four stands of rolls. The blooms are cut by a 10x10 inch vertical bloom shear, which is electrically-driven, but has hydraulic movements. If the blooms are intended for the billet mill, they are conveyed by the electrically operated approach table to the first stand of billet mill rolls. Blooms to be rolled into billets are $3\frac{1}{2}$x$3\frac{7}{8}$ inches in section. However, when larger blooms are being rolled for one of the company's other works or for outside consumption, a section of the billet mill approach table is tilted, and the blooms are discharged onto buggies from which they are loaded into freight cars in the yard. The crop ends of the blooms are discharged into a bucket in a concrete pit, from which the bucket is lifted by the mill crane. A standard gage track at right angles to the length of the building extends the width of the plant between the bloom shear and the continuous billet mill. Supplies, spare parts, etc., are received over this track, and to permit the ingress and egress of cars, as well as loading the blooms intended for the billet mill onto buggies, a section of the billet mill approach table is so constructed that it can be tilted through an arc of 90 degrees.

The billet mill is of the Morgan continuous type, and consists only of four stands of rolls, which marks a radical departure in continuous billet mill construction, as the majority of mills of this type contain six and eight stands of rolls. The amount of reduction in the mill of the four-stand type over that of the six or eight-stand type is considerably increased per pass. When the bloom enters the first stand of rolls, the amount of reduction is 35.5 per cent.; second stand, 28.5 per cent.; third stand, 34.5 per cent., and fourth stand, 25 per cent. This reduction is considerably larger than that of continuous billet mills now generally in operation, which rarely exceed 27 or 28 per cent. during the earlier passes. The billets are rolled into $1\frac{3}{4}$, 2 and $2\frac{1}{2}$ inch sections, according to the size of the finished product, for which they are intended. The mill also is equipped to roll 2x8 inch flats. When intended for finishing by the combined continuous rod and merchant bar mill, the billets are cut to 30 foot lengths, and for the 10 inch hand mill to 15 foot lengths by an Edwards flying shear located at the end of the billet mill runout table. From the shear table the billets are delivered to a skew table, operated by a 75 horse power motor and onto the cooling bed. The cooling bed straightening device and the push-off each are operated by 50 horse power, direct current motors.

# THE COBALT SERIES*

By Morley E. Wilson.

The Cobalt series consist of an assemblage of clastic sediments, conglomerate, greywacke, argillite, arkose, and quartzite. These rocks are not sharply defined members, for they not only pass gradationally into one another, both horizontally and vertically, but conglomerate commonly occurs in the midst of greywacke or greywacke in the midst of conglomerate, and a similar relationship may exist between all the members of the series. Nevertheless, in a general way, there is a succession in most localities, from a basal conglomerate through greywacke and argillite to arkose, which in turn is overlain by an upper conglomerate.

A compilation of all the published observations of the succession and thickness of the various rocks comprising the series throughout the Timiskaming region shows that there is generally an upper and lower conglomerate with greywacke and argillite, quartzite, and arkose as intermediate members.

**Basal Conglomerate**—Wherever the Cobalt series is seen in contact with the rocks of the older complex, the basal member of the series is usually a conglomerate. The outstanding feature of this basal conglomerate is its heterogenity, not only in the size and angularity of the included fragments, but in the variability of the rock, both in texture and composition from point to

*Extracts from a paper published in Journal of Geology, Feb., 1913.

point. In some places it is largely composed of coarse fragmental material with little matrix and, in other places, consists largely of matrix with few fragments. As a rule it is unstratified, but locally a partial alignment of the pebbles can be seen.

The matrix of the conglomerate varies greatly in texture and composition and may be either coarse and feldspathic or exceedingly fine grained and slate-like in appearance; the coarser types are, however, by far the most common. Examined under the microscope the matrix is seen to be composed of angular, subangular, and round fragments of quartz, feldspar, quartz porphyry, mica schist, rhyolite, andesite, basalt, and other rocks inclosed in a cement consisting chiefly of chlorite, but usually accompanied by small quantities of carbonate, epidote and pyrite.

The pebbles and boulders of the conglomerate include, even in a single rock exposure, nearly every variety of rock occurring in the older complex. Fragments of granite occur everywhere, and are commonly many miles from the nearest occurrence of this rock in the underlying basement from which the Cobalt series was evidently derived. As is generally characteristic of coarsely clastic sediments of this character, the pebbles and boulders are commonly subangular or angular in shape though round fragments are also present.

**Greywacke and Argillite.**—The basal conglomerate of the Cobalt series commonly passes gradually upward by the loss of its pebbles and boulders into greywacke and argillite. This greywacke was originally a ferromagnesian sand and the argillite a ferromagnesian mud, both of which are now, however, very firmly cemented, the argillite resembling a slate but differing from a slate in possessing no slaty cleavage. The greywacke and argillite, like the other members of the Cobalt series, vary greatly, and here and there contain beds of arkose, masses of conglomerate, and in some places, single isolated boulders. In a few places the greywacke is unstratified, but as a rule both it and the argillite are uniformly bedded. The microscopic examination of the greywacke shows it to consist of fragments of quartz, feldspar, basalt, andesite, and other ferromagnesian rocks along with an abundance of chlorite. The argillite is much finer grained than the greywacke, consisting of exceedingly minute fragments of quartz and feldspar imbedded in a chloritic cement. Small quantities of sericite, epidote, and carbonate are also commonly present in all of these rocks.

**Arkose and Quartzite.**—The greywacke and argillite are usually replaced on passing upward by arkose or quartzite, the transition taking place by a gradual increase in the feldspar and quartz content or by an alteration of beds of the two rocks. The arkose and quartzite are firmly cemented sands which, when examined under the microscope, are found to consist of round, angular, or subangular fragments of quartz, or of quartz and feldspar along with small quantities of calcite, sericite, epidote, pyrite, and other minerals. They are generally stratified, may show ripple marks, are locally cross-bedded, and in places contain well-rounded pebbles of quartz and jasper in lenticular aggregations.

**Upper Conglomerate.**—Wherever the Cobalt series has a considerable vertical thickness, the arkose and quartzite are overlain conformably by an upper conglomerate which differs in no respect from the lower member of the series and cannot be distinguished from it except where the stratigraphical succession is known.

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# THE PROBLEMS OF GOLD AT DEPTH*

By Hugh F. Marriot.

Much has been said from time to time during the life of the Rand about the present and prospective decrease of value in depth, and it is now desirable that the line of argument as regards these fields should be put on a definite and rational basis.

The relations between the earlier mining records and those now being produced have been fully set forth in the contributions to discussion from Mr. H. S. Denny and myself on Mr. Schmitt's paper (Transactions I.M.M., London, Chemical, Metallurgical and Mining Society, South Africa), and need no further elaboration here. The present contribution deals rather with the wider geological point at issue.

In dealing with ore deposits as they were chiefly known previous to the discovery of the Rand, it was only natural for the theorists to come to the conclusion that veins and fissures would be found to be poorer the deeper they were opened up, because, until the comparatively recent intense search for valuable minerals throughout the world, the majority of the deposits which had been worked were, by reason of the greater ease of their selection, in that particular class which affords the evidence in support of the formation of a theory on these lines.

All mineral deposits have limits to their extent both laterally and vertically, and, in the cases where the valuable mineral has been introduced upwards from below, the vertical length of each lens naturally tends to be greater than the lateral extension. I use the word "lens" advisedly, for in the succeeding argument all deposits which have defined limits and defined thickness may be considered as variations of lens-formation when spoken of broadly as regards their mass. In the natural process of denudation of the surface, these lenses are weathered down together with the surrounding country, and it is when their greatest thickness—and therefore their most important horizon—is reached that they offer more resistance to the denuding influences than does the country rock, and so stand up above the normal surface, thereby offering easy evidence to the prospector. This evidence is often supplemented by a large amount of surrounding detritus, being the product of denudation. If it happens that the thickest portion of the mass has not yet been brought to the surface horizon, subsequent mining operations will, in time, pass through it, and will thereafter continue down into the narrower portion of the lens until that particular deposit pans out.

*From South African Mining Journal, Sept., 1912.

That is the type of mineral deposit which, till recent years, has formed the subject of the mining operations in the majority of vertical and inclined veins and lenses of the world. Other deposits there are on which denudation has done its entire work, and, when the rich material on the surface which still remains in concrete form in large blocks has been cleared up, the underlying country has been found to contain the merest stringers of what was, in the higher levels, a magnificent deposit. A vast field yet remains for future generations, who will be equipped with appliances for detection, the nature of which are only now dimly indicated by embryonic investigations in the science. Further developments will provide the means to find those lenses, which either give no indication of their contents on the surface at all or present so insignificant an outcrop in size and value, that they are to-day left untouched. This may be taken to apply to the type of ore deposits that have until recent times formed the chief sources of production. The field is now so vastly widened that it is necessary to review the position afresh and to be prepared to discard many of the theories which have of necessity only been formed on one section alone of the mineral wealth of the world.

I have pointed out that the majority of the evidence of decrease of value in depth has been taken from those deposits in which the measurement has been greater in their vertical than in their horizontal axis. Let us now take a broad view of the Rand deposit as seen from the standpoint of nature, regardless of the many small readings with which it has been burdened, based on the comparatively small and haphazard disclosures made by human agency.

Between the extremities of Randfontein and Modderfontein there are about fifty miles of banket, which can be considered from a natural standpoint as one continuous and systematic gold-bearing deposit. Take the present developed depth of the Rand, say five thousand feet vertical or ten thousand feet on the dip, and study the formation diagrammatically by drawing a rectangle with the horizontal side to represent fifty miles in length and the vertical side to represent five, ten, or, if you wish to look far into the future, twenty thousand feet on the incline. In each one of these cases you will obtain a representation that will show far less depth in proportion to the length than is the case between any two levels in any average mine in the normal type of ore deposit. From the point of view of nature, this is one great gold deposit, and it is altogether unreasonable to suppose that the purely fortuitous position of the outcrop horizon, embracing a strip of ground almost of length without breadth, was selected by the various agencies responsible for the deposition of the gold in direct opposition to all the observed procedure in other mineral deposits of the world. Whether the gold came in with the pebbles from above downwards, or from below along the plane of least resistance upwards, or whether it filtered in from the great mass of the surrounding country and found a final resting place in concentrated form in the conglomerate, one thing is certain, that there is no argument that can support the theory that nature has chosen a strip fifty miles horizontal by two miles on the incline, to the exclusion of the remainder of the great stretches of the banket deposit throughout the Witwatersrand series, or, to bring it within practical limits, to the exclusion of the next two miles southwards on the incline. That the weathering away of the surface from unknown heights to the level of the present outcrop has taken place is evidenced by the rich deposits of gold which occurred in the oxidized zone in the vicinity of the surface in the higher grade sections and has been worked out in the early days of the more notable mines. The gold so deposited can have been but a small portion of that which was originally contained in the subsequently denuded banket, but the amount found redeposited in sub-outcrops of the reefs in situ shows that the formation must have been subjected to denudation to the extent of thousands of feet.

As regards the variability of gold content in detail, it is not possible to give any rule for the mode of accretion of what is locally termed the "payable" as against the "unpayable" portion of the deposits. The most that can be said is that the consistently richer portions lie in series of irregularly-shaped areas of which the units can be observed as measuring roughly up to five thousand feet by two thousand five hundred feet on their major and minor axes. There is an indication that evidence will be forthcoming, as the development of the country progresses, that these richer areas form links in a series of huge zone formations, which wind about without limitation of horizon through the great mass of the Witwatersrand beds. The mine development to-day is the greatest where these zones have been bisected by the line of outcrop.

To revert for a moment to the comparison usually made between present results and those of former years and to show how fallacious as a means of argument is the hitherto commonly accepted basis of yield, I will quote one instance where I have made a comparison on a comprehensive scale between the records of the old workings near the surface and those now being prosecuted at the greater depths. The assay values of the tonnage measured over the stope widths stand in the records of the old workings in the upper levels over the various sections of country as 9.7 dwts, over five feet, 17.3 dwts. over four feet six inches, and 10.9 dwts. over four feet six inches. When removed from their richly endowed home in the narrower stoping width that used to be considered sufficient for the moderate ideas and small mills of the early days and translated into figures distributed over the actual stoping widths from which the ore is extracted by the present methods, the above records taken in their due proportion are represented as 8.8 dwts. over six feet six inches, and when compared on a common basis, there is only the difference of a fifth of a pennyweight between the two periods.

There is yet much ore rich in gold-content to be found in the unprobed depths of the Witwatersrand, but to be a profit producer it must, when found, be treated as nature has made it, and be extracted by methods of mining which will enable it to give the full force of its value in the mills in which it is treated. In the meantime, judging the Rand from a comprehensive standpoint, the deepest level work is merely prospecting, and it will not be until the now opened up deeper developments of to-day have been extended throughout their horizon so as to form connecting links in the chain of evidence at the depth of the present deepest line of shafts that we shall be able to select with some degree of accuracy those sections of the Main Reef series which will be, in the depths yet unexplored, the successors to the rich producers at the outcrop.

# PERSONAL AND GENERAL

F. C. Alsdorf has returned to Boston from a trip to Cobalt and Kirkland Lake.

Charles M. Henrotin has returned from a visit to Kirkland Lake properties.

J. B. Tyrrell has returned from Harricanaw district, where he has been investigating reported gold discoveries, and will join the Sudbury Cobalt-Porcupine excursion of the Geological Congress.

The Northern Customs Concentrator has been sold to the owners of Cobalt Townsite and other mines at Cobalt. The contracts have not been sold, however, and a new mill will be built near La Rose mine to treat ore from La Rose and Cobalt Comet mines.

The annual meeting of the American Institute of Mining Engineers will be held in Butte, Montana, on August 18th. Members attending this meeting can, if they wish, join either excursion C-1 or C-2 of the Geological Congress at Vancouver and take part in the return portion of it. They also have time before the meeting to take part in the Session at Toronto.

Mr. Jos. Trethewey, of Cobalt, has been investigating the mineral resources of a part of the Hazelton district, in the Skeena River country, British Columbia, from which district a commencement has been made to send out silver-lead ore, ten cars having lately been shipped from the Silver Standard mine to the Consolidated Mining and Smelting Co.'s smeltery at Trail.

Mr. J. M. Turnbull, of Trail, B.C., has been preparing to do development work on a group of mineral claims near Howe Sound, Vancouver mining division, which property the Consolidated Mining and Smelting Co. will explore under option of purchase.

Mr. J. L. Warner has returned to Rossland and has lately been busy in connection with the installation of some power plant on one of the claims held by the Richmond Consolidated Mining Co., situated in the South Belt of the camp.

Mr. E. R. Wolfe, of Spokane, Washington, is manager for the Florence Mining Co., which is doing work on the Hope property in Ainsworth mining division, British Columbia.

Mr. Geo. W. Wooster, of Grand Forks, B.C., treasurer and director of the Granby Consolidated Mining, Smelting and Power Co., was lately on a visit to the company's property at Granby Bay, Observatory Inlet, where a smeltery is being erected and equipped to treat ore from the company's Hidden Creek copper mines.

Wm. H. Green, formerly of the Toronto University staff in mineralogy, is now at Ironwood on the Gogebic Iron Range, Michigan.

Robert B. Stewart is at Saskatoon preparing for an exploration trip in Northern Alberta.

Mr. W. M. Archibald, of the Consolidated Mining and Smelting Co.'s mining engineering staff, has made Nelson, B. C., his headquarters of late.

Mr. E. Berryman has for more than a year superintended the work of exploring various mineral claims on Copper mountain, Similkameen district, B. C., held by the British Columbia Copper Co., under option of purchase. Mr. F. R. Weekes is resident engineer at these properties.

Mr. James Buchanan, superintendent of the Consolidated Mining and Smelting Co.'s lead and copper smeltery at Trail, B. C., is on a visit to Scotland. Mr. M. H. Sullivan, assistant superintendent, is in charge at those works.

Mr. J. C. Edwards, superintendent for the Treasure Mountain Silver-Lead Mining Co., of Spokane, Washington, which has for nearly two years been developing mineral claims situated in Summit camp, near the headquarters of Tulameen River, B. C., has returned to Treasure mountain from a business visit to Spokane.

Mr. James Humes, for several years connected with mining properties on Vancouver Island, B. C., is now superintendent for the Silver King Consolidated, at Park City, Utah, U. S. A. His son has succeeded him in charge of the King Solomon property on Koksilah mountain, Vancouver Island.

Mr. R. H. Ley, formerly practising assaying at Nelson, B. C., is now visiting various mining districts of that province in the interest of the Giant Powder Co., Inc.

Mr. O. E. Leroy, of the Geological Survey of Canada, is on an official visit to British Columbia.

Sir Richard McBride, Premier and Minister of Mines for British Columbia, will shortly pay another visit to England, whence he will go on important official business.

Mr. Frank E. Pearce, formerly of Baker City, Oregon, but now manager for the company owning the Inland Empire gold mine and stamp mill in Trail Creek mining division, British Columbia, has been on a visit to the coast cities, Victoria and Vancouver.

Mr. Wm. Springer, one of the pioneers of the Slocan, British Columbia, and for the past year in charge of development work on the Idaho-Alamo group of mineral claims for the Finch syndicate, has gone on a prospecting trip to the North Thompson River, B. C.

The capitalization of Canadian Boving Company, hydraulic and general power engineers, has been increased to $1,000,000, and the company is now being operated under the title of Boving & Co., of Canada, Ltd. The company recently purchased the works of the Madison Williams Manufacturing Company of Lindsay, Ontario, and will manufacture water turbines, centrifugal pumps, etc.

In a recent decision in the U. S. Court at Pittsburg, Pa., in the case between Duplex Metals Company, complainant, and Standard Underground Cable Company, defendant, regarding copper clad wire, the case in so far as it is based on alleged infringement of patent, was dismissed on the ground that defendants have not infringed said patent.

It has been announced in a press despatch that Hon. T. W. Crothers, Dominion Minister of Labour, plans to make a flying trip to the Pacific coast in July for the purpose of personally investigating matters in connection with the labour troubles that have caused a suspension of work at some of the coal mines on Vancouver Island, B.C.

Mr. Clarence Cunningham, of Seattle, Washington, whose name has been prominently before the public in connection with coal lands in Alaska, was in the Similkameen district of British Columbia in the latter part of June, examining mineral claims in camps along the Similkameen and Tulameen Rivers. In the same party was Mr. E. F. Fields, of Spokane, Washington, a mining engineer well known in that state.

Mr. J. C. Edwards, who for more than a year has been engaged in directing the developmnt of the Treasure Mountain Silver-Lead Co.'s mineral claims in Summit camp, Tulameen district, B.C., was a recent visitor to Spokane, Washington, in which city his company has its head office.

# SPECIAL CORRESPONDENCE

## COBALT, GOWGANDA AND SOUTH LORRAIN

**Nipissing Finds Branch Vein at No. 73.**—For the month of June the Nipissing shipped $388.883 net, and produced net value $215,418. The shipment included bullion from ore taken as customs at the high grade mill.

The most important development of the month was the cutting of a branch vein at the third level of shaft 73. When first encountered, the vein assayed 3,000 ounces over a width of three to four inches. Twenty feet of drifting has already been done on this branch, and although somewhat smaller the grade remains the same.

The cross-cut at the 650 ft. level of the 64 shaft is in 60 feet. One hundred and twenty feet will be necessary to cut the vein. A calcite seam, several inches in width was encountered at 40 feet, but it is of low assay, and probably is the same vein cut across the shaft at a depth of 500 feet. This is all dead work.

Hydraulic prospecting between the high and low grade mill was completed. A large number of small seams were encountered, most of them showing some cobalt. Two have a width of two to four inches, but have only fair assays. Another one has a width of one inch over a width of 75 feet, and at one point shows high grade ore. All of these veins will be worked this summer. The hydraulic line has been changed and ground is now being prospected between Little Silver Hill and veins No. 19 and 27. Nearly all of the ground to be washed is conglomerate. The high grade mill treated 147 tons and shipped 570,703 ounces of silver. The low grade mill treated 6,291 tons.

**Bailey Mine Opens High Grade Shoot.**—A good shoot of high grade ore has recently been opened up at the west end of the first level of the Bailey mine. The vein is from an inch and a half to two inches wide and at the point where the strike was made is about 150 feet below the top of the cliff. The ore is a heavy niccolite and exceptionally high grade. It has been opened up for about 16 or 20 feet. This is not a continuous shoot of ore, since for several rounds the ore is merely cobalt, with low silver values. The vein on the fourth level has been opened up for 140 feet. All this is high grade ore of an average value of 1,200 ounces per ton, the vein being from two to three inches wide. On the third level the main vein is three to four inches wide, and has been drifted upon for 86 feet. Of this possibly two-thirds is high grade, while the rest will make milling ore.

**McKinley-Darragh-Savage Finds New Ore Body.**—The production for the McKinley-Darragh-Savage mines for the month of June was 185,182 ounces, of which 56,191 ounces came from the Savage and 128,271 ounces from the McKinley. The feature of the month was the discovery of an entirely new ore body on the Savage in virgin territory. This was discovered at the 140 foot level. There is only about 25 feet of ore on this level, where it averaged two to three inches of 5,000 ounces. It has all the appearance of being the apex of an ore shoot, and a cross-cut is being run at the 190 foot level to pick it up. The No. 2 vein on the Savage at the 190 level has been yielding surprisingly well, though for some time it contained nothing but cobalt with low silver values. This was found when raising in the stope near the Provincial line. The new ore shoot at the McKinley-Darragh is on the No. 40 vein, at the 100 foot level. For a hundred feet this vein is in good milling ore, but with no high grade to sweeten it. At this point there is now three inches of 5,000 ounce ore.

**Good Ore From Low Levels at Timiskaming Mine.**—At the bottom of the winze, 40 feet below the 575 foot level at the Timiskaming mine, some remarkable high grade is coming through the ore house. The vein in diabase is at this point fully six inches of bonanza silver ore. Below the contact in the diabase there has been opened up for 112 feet a shoot of high grade. This only goes up to the contact, and has for the most part been stoped out. It is remarkable that while extensions of profitable veins in the Keewatin rocks have been discovered, none of them carry any silver values. The "Diabase" vein is an entirely new ore body, though it is running parallel to those on the upper levels. At the 650 foot level there is good milling ore in another vein, with occasional shoots of high grade.

**The Seneca-Superior Mining Company** declared a dividend of 10 cents on the dollar. The Seneca-Superior, with this disbursement, will have paid 40 per cent. on a capitalization of a half a million dollars, and as the mining of ore only commenced on Oct. 21, 1912, this is a remarkable performance. It was decided to put the company on a bi-monthly dividend basis of 10 per cent., meaning 60 per cent. a year. The mine will also go on a regular production basis of 100,000 ounces per month. Between the main shaft at the 200 foot level and the No. 2 on the opposite side of Peterson Lake, there is an ore shoot over 400 feet in length, which will run between 4,200 and 4,500 ounces to the ton.

## SWASTIKA, KIRKLAND LAKE AND PORCUPINE

**Hollinger Made Good Progress in June.**—With the power trouble over and the strike disappearing on the horizon, the Hollinger profits for June were back to normal, and the costs are rapidly being cut down. Mr. P. A. Robbins, in his June report, says: "Upon June 17 the winze which is being sunk on No. 1 vein has reached a depth of 74 feet below the 300 foot level. There has been no change in the character or value of the ore. Work upon the 300 foot level continues to demonstrate values consistent with those encountered upon the upper levels. The work of sinking upon the No. 7 vein has been commenced, and at a depth of 12 feet the vein is two and a half feet wide and carries $16.50 a ton. This vein is classed under miscellaneous in the last annual report. Working costs have been reduced to $5.47 per ton, and further reductions are hoped for."

The mill ran 94 per cent. of the possible running time, treating a total of 11,867 tons. The average value of ore treated was $16.50 per ton, and the approximate extraction was 95 per cent. Milling costs were $1.398 per ton milled.

**The McIntyre** is now sinking its Nos. 4 and 5 shafts. It is probable that these shafts will be carried down with all expedition to 700 or 800 feet, opening up levels at each 100 feet.

**Ernhous Claims Being Developed.**—Capitalists associated with the Nipissing Mining Company are developing the Ernhous claims in the Kirkland Lake section on a working option basis. These claims adjoin the Hunton, upon which a rich discovery was made some weeks ago. The work consists entirely in stripping.

**Burnside Discovery.**—The discovery on the Burnside claim at Kirkland Lake has aroused more excitement than anything since the Tough-Oakes began to develop. A vein paralleling several others, which had been discovered previously, has now been opened up for 100 feet. It does not appear very rich on the surface, and shots were put in at various places along the fissure, with the result that ore very similar in character to the Tough-Oakes was uncovered. This high grade streak is from 17 to 21 inches wide, and is in places remarkably rich in free gold, and tellurides are plainly visible. Shaft sinking has been abandoned for the present in favour of prospecting. The property is under option to a Haileybury syndicate, consisting of Messrs. C. A. Foster, A. A. Ferland, R. T. Shillington, Fred Shillington, Charles A. Richardson and others. This is the principal discovery in the new gold area, but there have been several of minor importance. A very narrow vein exhibiting gold and tellurides has been stripped on the Robbins claims, and some free gold has been discovered in a wide vein on the Wright property.

**On the Tough-Oakes Claims,** which will be thrown into a stock company known as the Tough-Oakes Mines, Ltd., the shaft is down 180 feet on the incline. The vein is still good at the bottom, though the high grade is broken up into several stringers. A head frame is being erected. Experience at the small five stamp mill has shown that straight amalgamation will not save much more than 70 per cent. of the values, and a larger plant will have to be installed. This will be financed by the new issue of stock in the company.

**The Government Road to Kirkland Lake** is being rapidly constructed. With a little care taken to fix up the bad spots in the road, it will soon be available for traffic.

**The Extension of Time** allowed under the amendment in the Mining Act for assessment work on claims expired on July 15th. The first year's work on a very large number of claims has been sworn in; but as there is no inspection, there is no doubt whatever that far less than the statutory amount has been done in many cases. This has been demonstrated in the Mining Commissioner's court, recently where Mr. Gordson has threatened to bring several witnesses in mining disputes to the attention of the Attorney-General for perjury.

## BRITISH COLUMBIA

As the second half of the year is entered upon, the prospects for continued activity in the chief mining districts of the province are generally favourable, with the single exception of Nanaimo district of Vancouver Island, where the coal mines are idle, owing to the United Mine Workers of America having called a strike, which has caused a suspension of operations since the end of April. There are other parts of the province where miners' unions claim that mining is being interfered with, by their having directed their members to stop work, namely, at the Britannia mine, in Vancouver mining division, and at the Queen mine, in Nelson division, but outside of having reduced the number of workers at the latter by about a score, there is no effective prevention of production.

While no information has been received from the placer gold mining districts, reports from various other parts of the province tell of an unusually cool, and in many places wet, summer, so it is hoped Atlin and Cariboo are experiencing similar weather, for, if so, the effect will be a prolongation of the season during which their gravel washing operations can be continued. Lode mining is being carried on and ore pro-

**Shaft on Property of Burnside Syndicate, Kirkland Lake, Ont.**

Good ore has been recently discovered on this property by stripping duction records show that the output is being maintained on about a similar scale to that of last year. With the exception above mentioned, coal mining, too, is fully up to its customary condition of productiveness.

### Rossland.

Ore production figures show the output of mines in Trail Creek mining division during six months to July 1 to have been approximately 121,000 tons, this amount including about 1,000 tons treated at the 10 stamp mill at the Inland Empire mine, which is situated some miles away from Rossland, and the whole of the remainder from mines in the immediate vicinity of that city. The Consolidated Company's mines produced 101,000 tons (Centre Star group nearly 72,000 tons and Le Roi 29,000 tons), and those of the Le Roi No. 2, Ltd., 18,500 tons. Several small shippers made up the remaining few hundred tons. Of this total about 112,000 tons was shipped to the Consolidated Company's smeltery at Trail, this including between 800 and 900 tons of gold-copper concentrate from the Le Roi No. 2 concentrator at Rossland. Incidentally, it may be mentioned that the total of ore and concentrates received at the Trail works during the six months was between 160,000 and 170,000 tons, and of this aggregate Rossland mines contributed fully two-thirds.

No particulars relative to operations at the Consolidated Company's mines at Rossland are available just now. It is generally understood though that there has been opened in them an abundance of ore, and some of it containing comparatively high value in gold, so that the prevailing feeling in the Rossland community is one of confidence that the mines on Red Mountain will continue to be productive and profitable for many years. An indication that this confidence is well founded is found in a recent announcement that the C.P.R. intends to substitute electric power for steam on its railway to Rossland.

Mining operations this year at the Josie mine of the Le Roi No. 2, Ltd., have been chiefly on the 300, 500, 700 and 900 foot levels. The ratification of the agreement between this company and the Consolidated Mining and Smelting Company of Canada, Ltd., information relative to which has already been published, has had this result—the former company has since been able to do underground work which cannot now be questioned on the grounds of extra-lateral rights of the Consolidated Company. Several new ore bodies have been discovered and worked. The rate of development work and production has been much the same as during the company's last fiscal year, when development was at the rate of rather more than 500 ft. a month, diamond drilling nearly 1,200 ft., and production about 3,000 tons of ore, of which rather more than one-half was sorted out for shipment crude direct to the smeltery, and the remainder concentrated into 140 tons of gold-copper concentrate monthly. Some work has been done on the 1,500 foot level, which corresponds in depth with that of the 1,650 level of the adjoining Le Roi mine, and ore found here of a value of $14 to $15 in gold a ton and 0.33 per cent. copper. Permission has been obtained to use the Le Roi 1,650 foot level from which to open the Josie mine at this depth, and this will for the time being do away with the necessity of sinking the Josie shaft 200 ft. deeper and cross-cutting about 900 ft. A new centrifugal electrically operated pump has been obtained to replace the pumps now in use on the 500 foot level of the Josie mine. This additional pumping power has been provided to admit of the company's neighbouring No. 1 mine being unwatered, as well as of pumping from the Josie, at the one station. Water from No. 1 will be drained along the Josie 500 foot level, the workings of the two mines being separated by only 70 ft. of rock, through which diamond drill holes will give an outlet for water from No. 1 mine. Diamond drilling into the northern ground of the Le Roi No. 2 group has been done, with the permission of the Consolidated Company, from the ninth level of the War Eagle mine, the depth of which about corresponds with the 900 foot level of the Josie. Altogether, the outlook for the Le Roi No. 2, Ltd., is regarded as satisfactory, which is also the condition in respect of other productive mines on Red Mountain, this comprising the main productive area of Rossland camp.

For a while there was no mining, nor preparation for any, in the South Belt of the camp, operations having been suspended at different times during the last twelve months on the Blue Bird, Richmond Consolidated group and Phoenix, all three of which were being worked last summer. Now a power plant, including a hoist and a 12 drill compressor, is being put in at the Lily May, one of the Richmond-Consolidated Company's properties. The Rossland Miner on July 9 gave the following information relative to this property: "At the properties of the Richmond Consolidated there is great activity and 25 men have been employed during the past week in the construction of buildings. All concrete work is finished and the bedplates laid ready for the compressor, as soon as the compressor building shall be covered in. The assay office—a four-room building—is completed, and the compressor building will be this week. The gallows frame is being constructed, and the blacksmith and machine shops will be erected this week. Timbering the double compartment shaft down to 55 ft. from the surface has been completed. Mining will be commenced as soon as all the construction work shall be done. The present outlet from the mine is by wagon road, one mile to the Canadian Pacific Railway from Rossland to Trail, but eventually an aerial tramway will be constructed from the mine to the railway."

### Osoyoos.

The Dividend-Lakeview Consolidated Gold Mining Company is developing its Dividend mineral claim, situated on Kruger Mountain, near Osoyoos Lake. The group includes the Dividend, Lakeview and Gold Dust claims, but at present work is being done only on the Dividend. Ore is being hauled in a 5 ton motor truck to Oroville, nearly seven miles distant, and is taken thence by railway to the Granby Company's smeltery at Grand Forks, Boundary district. Value is in gold and silver, and, owing to the high freight cost, only ore running $25 a ton or higher is shipped. The property is situated within a short distance of the International Boundary line, just across which, in the State of Washington, the Golden Chariot and other claims in the vicinity are also being developed.

### Hedley.

There is little mining work being done in Hedley camp, Similkameen, other than that on the Hedley Gold Mining Company's property. One exception is the New York No. 2 Syndicate, which is operationg two diamond drills, capable of drilling to a depth of 2,500 ft. Both water and compressed-air are conveyed from the Hedley Gold Mining Company's mine, the pipe lines being each about 5,000 ft. long. The claims on which the drilling is being done are held by the syndicate under option of purchase. The object of the work is to prove whether or not the Nickel Plate ore bodies extend into the ground being drilled.

At the Hedley Gold Mining Company's Nickel Plate mine, the greater part of the work is being done from No. 4 adit level, and to facilitate operations buildings are being erected near the portal of this tunnel. A new blacksmith and machine shop—a wood frame building, dimensions 95 by 35 ft., roofed with corrugated galvanized iron—has been erected, and this is being equipped with all necessary power-tools and other mechanical appliances and plant. Another building includes store and warehouse, the former 50 by 35 ft., and two storeys high, and the latter a single storey compartment, 90 by 35 ft. Ground is being graded for a building to comprise cookhouse, dining-room, wash-rooms for men, recreation-room, etc., to be of similar construction to above-mentioned buildings and to provide accommodation for about 1500 men.

Last year's development and diamond drill work having warranted the estimate that the minimum quantity of reserve ore available in the company's Nickel Plate and Iron Duke claims was 413,000 tons, of an average value of at least $11.35 per ton, another incline shaft, known as the Dickson incline, is being sunk to mine the new ore bodies then developed, and others also below the level of No. 4 adit of the Nickel Plate mine. This incline is being sunk to the north-west on the pitch of the lowest known ore body in the mine. The intention is to sink it to a depth of 3,000 ft. It is so situated as to be under all the ore bodies, and will have pay ore above it continuously for 1,100 ft.

No. 5 incline has been sunk, in the same direction as the Dickson, to a depth of 420 ft., and four levels have been opened from it. There are in this part of the mine three known ore bodies, lying directly one above the other, and this incline has been sunk in the middle one. Drifting and sinking have proved the ore to be about 16 ft. between walls, and its average value is $14 a ton. At the collar of the incline the length of the ore shoot is 130 ft.; at the 100 ft. level it has been drifted on 180 ft., and on the third level 120 ft. These drifts are in good ore all the way and, their faces, as well as the bottom of the incline, are in ore. This incline is in favourable condition for ore shipping, with ore pockets on each level and plenty of good ground for stoping.

No work is being done in the company's Sunnyside mine, owing to lack of power, nearly all available being used in connection with operations in the Nickel Plate mine. Some time since the company made application for water rights on Similkameen River, but it has not yet been able to secure the water it requires for additional power purposes, owing to other applicants, stated to be only speculators and not bona fide operators, having forestalled it, and so prevented it this year carrying out its plans for important extensions of its mining and milling operations.

The quantity of ore crushed during five months of 1913, to June 1, was 29,180 tons and the value of the recovered gold $377,483.14. This gives an average recovery of $12.936 a ton, as compared with $10.18 a ton for 27,936 tons crushed during the corresponding period of 1912, and with $10.62 a ton for 70,455 tons crushed during the whole of 1912. Assuming that the total costs were not higher than for 1912, when they averaged $5.14 a ton, it would appear as if the net profit for the five expired months of 1913 has been at an average rate of approximately $7.80 a ton.

### Granite Creek.

Messrs. J. A. Anderson and Andrew Gordon have been working for several years on ground situated about half a mile higher up the creek than Lambert & Stewart's dam. Lately they have been drifting with the object of finding an old channel at a higher level than that of the present creek. Other work done last year on the same bench gave varied results, the best having been a pocket of about 5 oz. of gold recovered in one place. At the present time water is causing the workers much trouble, the seepage from the hill above the drift amounting to quite a stream of water. In order to try to keep the drift dry, an Edison wrecking pump was lately obtained. There are indications that the drift is entering an old channel, and Messrs. Anderson and Gordon, who have been most persistent with their operations, are feeling hopeful accordingly.

Now that the high water season has passed and Messrs. Lambert & Stewart's dam across the creek, just above the mouth of the north fork, has stood the summer freshets preparations are being made to carry out the intended method of working the creek for about 1,000 feet below the dam. As soon as the water shall be low enough for the flume, that has been constructed for the purpose, to carry the stream the water will be diverted, and then a bed-rock flume will be taken up the creek bed and the pay dirt, from the top of which some six feet of overburden has been removed, will be sluiced. Commencing at zero at the lower end of the canyon, the gravel gradually increases in depth to about 15 feet just below the dam. The dirt has been prospected and it is confidently expected to yield good pay in both gold and platinum, in the proportion of about two of the former to one of the latter. Much interest is taken locally in this enterprise, for, if successful, it is expected it will lead to the working of some 12 to 14 miles of Granite creek above Lambert & Stewart's ground.

Coalmont, the new town dependent largely upon the operations of the Columbia Coal and Coke Co., of Winnipeg, Manitoba, is feeling the effect of the suspension of work on that company's coal property. After a long cross-cut adit had been driven and much other work done in connection with it, it was found necessary to abandon it and do work from the Collins Gulch side of the mountain. It is stated some good coal has been opened in the latter workings, but owing to exhaustion of funds all work has been stopped pending making new arrangements for financing the undertaking.

### Salmo.

In a report of meetings of the Labor Commission, which has been holding meetings in various parts of British Columbia, and taking evidence concerning labor conditions, the following reference to the position at the Queen Gold mine, in Nelson mining division, is made: "Queen mine has a labour dispute which is a hopeless tangle. Up to a little while ago there were 45 men employed at the mine; now there are 24. The men who have quit say there is a strike; the men who have remained at or returned to work say there is no strike at all, and that they are good unionists, who are satisfied with their condition. They say, further, that the men who have quit were induced to do so by misrepresentation. To an outsider the whole thing looks like an illustration of the pernicious activity by which a certain type of labour agitator often makes himself a public nuisance. In this particular instance, as in many others, the men who have stirred up the row are reported to have come from the United States."

### Nanaimo.

The Vancouver Board of Trade having offered to arbitrate the differences between the coal-mine owners and mine workers on Vancouver Island, replies were received from the respective general managers of the two larger companies, from which the following are excerpts: W. L. Coulson, general manager of the Canadian Collieries (Dunsmuir), Limited, operating the Cumberland and Extension collieries, each having several working coal mines, replied in part: "We appreciate very much the spirit in which your kind offer of arbitration for the settlement of the strike in the coal trade on Vancouver Island is made. As all our mines are now and have been for some time in satisfactory operation, we have no differences with our employees to arbitrate." Part of the reply of Mr. Thos. R. Stockett, manager of the Western Fuel Co., Nanaimo, follows: "So far as this company is concerned, there is nothing to arbitrate, the issue being solely—shall it turn its property over to the control and dictation of a foreign organization, which is without status in Canada, and not even amenable to its laws, and whose interests are inimical to the best interests of the workmen, the community, and the company? This the company is not willing to do, nor does it consider the question one for arbitration. For the information of your council and board, I may say that under this company's policy of dealing with its workmen as employees, there has prevailed in this community an era of nearly eight years of industrial peace and prosperity that has worked for the good of all, and but for the presence of foreign agitators, who caused the breaking of a working agreement between employer and employees (and without permitting the employees to have a voice in the matter), there is every reason to believe that industrial peace would have continued for many years."

The Pacific Coast Coal Mines, Ltd., has decided to try to operate its mines at South Wellington, three or four miles from Nanaimo, with non-union labour. A commencement has been made to resume getting out coal, but production as yet is on only a small scale. The miners on strike have been ordered to vacate the company's houses, which will be occupied by non-union men as soon as available for them.

## NOVA SCOTIA.

**Dominion Coal Outputs.**—Outputs in July showed a considerable improvement on June. To the fifteenth the production totalled 194,000 tons, and for the month it should reach 420,000 tons. Presuming this output for July the aggregate tonnage from the Glace Bay mines for the seven months ending 31st July, will be 2,715,000 tons, comparing with 2,533,000 tons for the same period of 1912, being an increase of 182,000 tons.

**Albion Mine Fire.**—The fire in the Albion mine has been extinguished. The fire was constantly fought for over a fortnight, in the face of most difficult circumstances and under dangerous conditions. Oxygen breathing apparatus and electric lamps were used, and the flames were combated at close quarters by helmet-men using hose and nozzle. It was finally found possible to isolate the fire area, and to completely submerge the burning material. Your correspondent has the best reasons for stating that it would have been well-nigh impossible to have extinguished the fire in the manner in which it was actually accomplished, had not breathing apparatus been available. In saying this, there is no wish to minimize in any way the heroism and skill with which the staff and men of the Acadia Coal Company fought the fire under almost intolerable conditions. Modern breathing apparatus, accompanied by electric hand lamps, will, however, enable men to breathe and see where, without these devices, life could not exist.

The fire at the Albion mine has given oxygen breathing apparatus probably the severest and longest testing as yet received in Nova Scotia, and when it is considered that these devices were used for nearly a fortnight, under the most strenuous conditions, without any accident, there can hardly be room for doubt as to their usefulness. Oxygen apparatus have been used in fighting mine fires at Sydney mines, at Springhill mines and at the Albion mine, and in every case they have proved invaluable.

The word "rescue" in connection with oxygen breathing apparatus has been consistently objected to by your correspondent, as obscuring the true usefulness of these devices. It is true that many lives have been saved which would otherwise have been lost, had not breathing apparatus been used, but the occasions on which these devices have been of use after mine explosions are but very few compared with the times they have been used successfully in fighting underground fires.

The possibilities of oxygen breathing apparatus are not limited to usefulness in mines, but are now being extended to the needs of the aviator and the submarine boat. The Draegerwerk, of Lubeck, will supply apparatus that will enable the aviator to live at an altitude impossible to the human being unprovided with such apparatus, and they will also supply an apparatus to enable the diver to walk along the sea-floor entirely independently of the surface air, and unhampered by the life-line that the old-style diver must take with him.

The crews of all German submarine boats are provided with breathing apparatus that will enable them to escape from a sunken submarine if the depth is not too great. It must, therefore, be obvious that the uses of breathing apparatus intended for use in mines is a reliable device, but that it will develop further improvements and usefulness may be confidently expected.

**The International Geological Congress.**—The members of the Congress, who will participate in the Nova Scotian excursion, are expected to spend the 23rd, 24th and 25th of July in the neighbourhood of Sydney, Glace Bay and Sydney Mines. Extensive preparations are being made for the visit by the large coal and steel companies in this vicinity, and if the weather is propitious the occasion will no doubt be a very enjoyable one. There is a great deal to see in Cape Breton to interest both the purely scientific geologist and those interested in industrial enterprise in other parts of the world.

**Shipping Coal from Sydney.**—The following extract is clipped from the "Iron and Coal Trades Review" of 20th June:

"There have been several instances of exceptional coaling at Immingham, but last week every record was eclipsed. The s.s. 'Gretchen Muller' commenced at 10.45 a.m. and finished at 4.30 p.m., which, after deducting meal hours and shifts, gives a net time of 3 hrs. 20 minutes during which time 1,586 tons of coal, constituting a full cargo, were shipped, an approximate average of 476 tons per hour."

The Immingham docks of the Hull & Barnsley Railway are the latest word in coal shipping in England, and serve as the main outlet of the South Yorkshire coal field for Baltic and other ports. The record of performance quoted will not, however, strike Cape Breton readers as constituting anything remarkable. It is a usual matter at the Sydney piers of the Dominion Coal Company to ship 7,000 tons of coal in five hours, and the same cargo can be discharged at the Montreal end in seven hours. On the occasion previously referred to in this correspondence when 18,130 tons was raised from the Glace Bay collieries in one day, there was also lifted from the storage banks 6,400 tons of coal, meaning that the Coal Company's railway and piers disposed of the enormous quantity of 24,500 tons of coal in one day. In the six days ending the 28th June the Coal Company's shipments totalled 123,000 tons, or well over 20,000 tons per day.

A notable incident in this connection was the coaling of H.M.S. "Cumberland" at Sydney on the 18th. This large cruiser of 22,000 tons laid alongside the loading pier of the Dominion Coal Company at Sydney, and took bunkers direct from the pier loading-chutes. The officers of the ship expressed themselves as surprised and pleased at the quick dispatch given. Coal was taken on board at the rate of 250 tons an hour, the loading occupying from 5 a.m. to about the same time in the evening. The rapidity of loading was of course limited by the stowing of the bunkers as the piers could have handled a great deal more. Other war vessels in Sydney have usually coaled from lighters in the stream. The commandant of the "Cumberland" is said to have expressed his opinion that Sydney Harbour was ideally suited for a naval coaling station, and that the harbour, railways and collieries should be protected by fortifications. Your correspondent has pointed out the value of Sydney and the coal mines adjacent in case of war on more than one occasion. The whole of Eastern Canada and the railway communication of half the Dominion depends for its motive power on the mines of Cape Breton. At the present time the mines and all means of transportation are entirely unprotected from attack by sea or land. All the mines are visible from sea, and make excellent targets.

# COMPANY NOTES

### DIVIDENDS PAID BY NIPISSING MINING CO.

The Cobalt Nugget prints the following statement of dividends paid by the Nipissing holding and operating companies to the end of June, 1913:

**Nipissing Mines Company (Holding Co.)**

| | | | | |
|---|---|---|---|---|
| 1906 | 3 | | | $ 480,000 |
| 1907 | 14 | | | 840,000 |
| 1908 | 12 | | | 720,000 |
| 1909 | 22½ | | | 1,350,000 |
| 1910 | 35 | | | 2,100,000 |
| 1911—Jan. 20 | 7½ | 450,000 | | |
| April 20 | 7½ | 450,000 | | |
| July 20 | 7½ | 450,000 | | |
| Oct. 20 | 7½ | 450,000 | | |
| | — | —— | 30% | 1,800,000 |
| 1912—Jan. 20 | 7½ | 450,000 | | |
| April 20 | 7½ | 450,000 | | |
| July 20 | 7½ | 450,000 | | |
| Oct. 20 | 7½ | 450,000 | | |
| | — | —— | 30% | 1,800,000 |
| | — | | | |
| Total | | | | $9,090,000 |
| 1913—Jan. 20 | 7½ | 450,000 | | |
| April 21 | 7½ | 450,000 | | |
| July 21 | 7½ | 450,000 | | |
| | — | —— | | 1,350,000 |

**Nipissing Mining Company (Operating Co.)**

| | |
|---|---|
| 1905—To Syndicate | $ 300,000 00 |
| 1906—To Syndicate | 100,000 00 |
| 1906—To Nipissing Mines Co. | 500,000 00 |
| 1907—To Nipissing Mines Co. | 880,000 00 |
| 1908—To Nipissing Mines Co. | 740,000 00 |
| 1909—To Nipissing Mines Co. | 1,370,000 00 |
| 1910—To Nipissing Mines Co. | 2,122,500 00 |
| 1911—To Nipissing Mines Co. | 1,853,430 49 |
| 1912—To Nipissing Mines Co. | 1,842,366 76 |
| Total | $9,708,297 25 |

**Nipissing Mines Co.**

The following is a brief financial statement of the affairs of the Nipissing Mining Company, Ltd., (the Operating Company), as of July 1st, 1913:

| | |
|---|---|
| Cash in bank | $1,090,558.59 |
| Ore and bullion in transit | 224,936.00 |
| Ore on hand and in process and bullion ready for shipment | 147,907.00 |
| | $1,463,401.59 |

The Seneca-Superior Silver Mines, Ltd., at a director's meeting on July 14 declared a bi-monthly dividend of ten cents a share payable on August 15th to shareholders of record at the close of business on the 10th of August, 1913. The company have cash in banks $127,249.00, and have ore in transit to the approximate value of $65,000, and are in the unique position of having shipped since the 11th of November last year, over 975,000 oz. of silver ore. The company have already paid three dividends of ten cents a share on February 15, April 15, and June 15, 1913.

# STATISTICS AND RETURNS

### COBALT ORE SHIPMENTS.

The shipments for the week ending June 25th, were:

| Mine. | High. | Low. | Pounds |
|---|---|---|---|
| La Rose | 1 | .. | 105,780 |
| Crown Reserve | 1 | .. | 45,000 |
| Cobalt Comet | 1 | .. | 78,500 |
| Dom. Reduction | 1 | .. | 89,200 |
| Townsite | 1 | .. | 46,400 |
| Cobalt Lake | 2 | .. | 126,590 |
| | 7 | .. | 491,390 |

The shipments from the Cobalt mines to date are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Bailey | 4 | 1 | 130.35 |
| Beaver | 8 | .. | 237.43 |
| Chambers-Ferland | 3 | 4 | 223.77 |
| City of Cobalt | 4 | .. | 105.14 |
| Cobalt Townsite | 36 | .. | 1,308.70 |
| Cobalt Lake | 18 | .. | 141.52 |
| Buffalo | 2 | .. | 66.13 |
| Coniagas | 27 | .. | 863.17 |
| Crown Reserve | 14 | .. | 643.44 |

| | | | |
|---|---|---|---|
| Cobalt Comet | 13 | .. | 341.10 |
| Green-Meehan | .. | 1 | 12.96 |
| Hudson Bay | 10 | .. | 369.81 |
| Kerr Lake | 16 | 1 | 440.60 |
| La Rose | 35 | 3 | 1,585.53 |
| McKinley-Darragh | 42 | .. | 1,467.29 |
| Nipissing | 2 | 35 | 1,070.35 |
| O'Brien | 7 | .. | 262.63 |
| Seneca-Superior | 5 | 3 | 249.44 |
| Silver Cliff | 1 | .. | 20.00 |
| Trethewey | 7 | 7 | 362.63 |
| Timiskaming | 10 | 1 | 331.98 |
| Casey Cobalt | 4 | .. | 264.72 |
| Colonial | 1 | .. | 21.56 |
| General Mines | .. | 1 | 8.80 |
| Silver Queen | .. | .. | 169.89 |
| Wettlaufer | .. | .. | 122.26 |
| Miller L. O'Brien | 2 | .. | 47.19 |
| Right of Way | 1 | 1 | 62.71 |
| Penn-Canadian | 4 | .. | 126.13 |
| Silver Bar | .. | 1 | 20.00 |
| Mann | 1 | .. | 20.00 |
| York Ontario | 1 | .. | 20.00 |
| Miscellaneous | 1 | .. | 88.05 |
| | 280 | 60 | 11,705.88 |

The bullion shipments for the past week are:

| Mine. | Ounces. | Value. |
|---|---|---|
| Nipissing | 3,231,500.01 | $1,859,880.62 |
| Penn-Can. | 7,219.30 | 4,351.08 |
| Buffalo | 823,582.90 | 523,042.19 |
| Cr. Reserve | 234,566.00 | 146,768.25 |
| Dom. Red | 314,860.40 | 181,256.58 |
| Townsite | 10,909.00 | 6,647.00 |
| Miscel. | 3,920.00 | 1,623.00 |
| Timiskaming | 9,469.20 | 5,443.72 |
| O'Brien | 93,184.77 | 47,603.88 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 11,178.83 | 6,886.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 14,278.98 | 9,047.98 |
| Bailey | 1,839.00 | 1,103.40 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Cobalt Comet | 998.50 | 579.13 |
| | 4,780,268.94 | $2,807,791.34 |

## B. C. ORE SHIPMENTS.

Shipments for week ending June 21 and for year to that date were:

### Slocan and Ainsworth.

| | | |
|---|---|---|
| Standard, mld. | 1,000 | 27,000 |
| Van Roi, milled | 700 | 15,207 |
| Rambler-Cariboo, milled | 300 | 7,000 |
| Bluebell, mld. | 1,400 | 40,323 |
| Richmond-Eureka | 30 | 445 |
| Standard | 216 | 7,986 |
| Bluebell | 224 | 4,169 |
| Ruth | 36 | 296 |
| Rambler-Cariboo | 76 | 1,792 |
| Van-Roi | 35 | 526 |
| Silver Hoard | 125 | 461 |
| No. 1 | 86 | 1,684 |
| Whitewater | 35 | 100 |
| Other mines | .. | 2,592 |
| Total | 4,263 | 109,581 |

### Rossland.

| | | |
|---|---|---|
| Inland Empire, milled | 275 | 1,925 |
| Le Roi No. 2, milled | 325 | 9,348 |
| Centre Star | 3,144 | 80,150 |
| Le Roi | 929 | 32,086 |
| Le Roi No. 2 | 334 | 11,985 |
| Other mines | ... | 199 |
| Total | 5,007 | 135,693 |

### East Kootenay.

| | | |
|---|---|---|
| Sullivan | 414 | 19,881 |
| Other mines | ... | 858 |
| Total | 414 | 20,739 |

### Nelson.

| | | |
|---|---|---|
| Queen, mld | 350 | 7,525 |
| Mother Lode, mld | 500 | 10,000 |
| Second Relief, mld. | 150 | 3,700 |
| Yankee Girl | 72 | 2,774 |
| Queen Victoria | 103 | 14,180 |
| Other mines | ... | 6,314 |
| Total | 1,175 | 44,493 |

### Lardeau.

| | | |
|---|---|---|
| Other mines | ... | 266 |

### Boundary.

| | | |
|---|---|---|
| Nickle Plate, mld. | 1,500 | 43,500 |
| Jewel, mld. | 300 | 2,300 |
| Knob Hill | 49 | 1,506 |
| Ben Hur | 163 | 7,176 |
| No. 7 | 148 | 4,136 |
| Granby | 24,124 | 686,555 |
| Mother Lode | 4,997 | 176,762 |
| Rawhide | 5,450 | 144,778 |
| Napoleon | 570 | 18,882 |
| Unnamed | 243 | 4,681 |
| Other mines | ... | 4,442 |
| Total | 37,544 | 1,094,718 |

### B. C. Copper Company's Receipts.

Greenwood, B. C.

| | | |
|---|---|---|
| Motherlode | 4,997 | 176,762 |
| Rawhide | 5,450 | 144,778 |
| Napoleon | 570 | 18,882 |
| Queen Victoria | 103 | 14,180 |
| Unnamed | 243 | 4,681 |
| Total | 11,363 | 359,283 |

### Granby Smelter Receipts.

Grand Forks, B. C.

| | | |
|---|---|---|
| Granby | 24,124 | 686,555 |

### Consolidated Company's Receipts,

Trail, B. C.

| | | |
|---|---|---|
| Knob Hill | 49 | 1,506 |
| Ben Hur | 163 | 7,176 |
| No. 7 | 148 | 4,136 |
| Silver Standard | 286 | 314 |
| Richmond-Eureka | 30 | 445 |
| Standard | 216 | 7,986 |
| Bluebell | 224 | 4,169 |
| Ruth | 36 | 296 |
| Rambler-Cariboo | 76 | 1,792 |
| Van-Roi | 35 | 526 |
| Silver Hoard | 125 | 461 |
| No. 1 | 86 | 1,684 |
| Whitewater | 35 | 100 |
| Yankee Girl | 72 | 2,774 |
| Centre Star | 3,144 | 80,150 |
| Le Roi | 929 | 32,086 |
| Le Roi No. 2 | 334 | 11,985 |
| Sullivan | 414 | 19,881 |
| Other mines | ... | 10,688 |
| Total | 6,402 | 188,355 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont).

### NEW YORK CURB.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 2.00 | 2.25 |
| Braden Copper | 6.87½ | 7.00 |
| Chino Copper | 37.25 | 37.50 |
| Giroux Copper | 1.50 | 1.75 |
| Goldfield Cons. | 1.50 | 1.62½ |
| Green Can. | 6.75 | 6.87½ |
| Inspiration Copper | 14.87½ | 15.00 |
| Ray Cons. Copper | 18.00 | 18.37½ |
| Standard Oil of N. J. | 361.00 | 363.00 |
| Standard Oil of N. Y. | 144.00 | 145.00 |
| Standard Oil, old stock | 1135.00 | ..... |
| Standard Oil Subs | 680.00 | ..... |
| Tonopah Mining | 4.18¾ | 4.25 |
| Tonopah Belmont | 6.12½ | 6.18¾ |
| Nevada Cons Copper | 16.25 | 16.37½ |
| Yukon Gold | 2.25 | 2.50 |

### PORCUPINE STOCKS.

| | Bid. | Ask. |
|---|---|---|
| Apex. | .01 | .02 |
| Crown Chartered | .00½ | .00⅝ |
| Dome Extension | .07 | .07¼ |
| Dome Lake | .41 | .44 |
| Dome Mines | 14.50 | 16.00 |
| Eldorado. | ... | ... |
| Foley O'Brien | .23 | .25 |
| Hollinger. | 15.85 | 16.00 |
| Jupiter. | .34 | .34¾ |
| McIntyre. | 1.75 | 2.35 |
| Moneta. | .03½ | .06 |
| North Dome. | .30 | .50 |
| Northern Exploration | .50 | 1.50 |
| Pearl Lake | .34 | .35 |
| Plenaurum. | .75 | 1.00 |
| Porcupine Gold | .09½ | .10¼ |
| Imperial. | .01½ | .02 |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .02 | .02½ |
| Rea. | .15 | .30 |
| Standard. | ... | ... |
| Swastika. | .04½ | .05 |
| United. | ... | ... |
| West Dome | .10 | .20 |

### Sundry.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 4.00 | 4.25 |
| Canadian Marconi | 2.00 | 3.00 |

### COBALT STOCKS.

| | Bid. | Ask. |
|---|---|---|
| Bailey. | .07⅞ | .08 |
| Beaver. | .30 | .31 |
| Canadian. | .22 | .25 |
| Chambers-Ferland. | .17¼ | .18 |
| City of Cobalt | .47 | .50 |
| Cobalt Lake | .60 | .65 |
| Coniagas. | 7.20 | 7.50 |
| Crown Reserve | 3.10 | 3.20 |
| Foster. | .06 | .07 |
| Gifford. | .04½ | .06 |
| Gould. | .03⅜ | .03½ |
| Great Northern | .15¾ | .16 |
| Hargraves. | .04½ | .05 |
| Hudson Bay | 68.00 | 70.00 |
| Kerr Lake | 3.45 | 3.55 |
| La Rose | 2.30 | 2.40 |
| McKinley. | 1.77 | 1.80 |
| Nipissing. | 8.45 | 8.55 |
| Peterson Lake | .22¼ | .22¾ |
| Right of Way | .04½ | .06 |
| Rochester. | .02½ | .03 |
| Leaf. | .03¼ | .03½ |
| Cochrane. | 1.10 | 1.25 |
| Silver Queen | .03 | .04 |
| Timiskaming. | .35 | .35½ |
| Trethewey. | .30 | .32 |
| Wettlaufer. | .11 | .11½ |
| Seneca Superior | 2.10 | 2.20 |
| Buffalo Mines. | 2.10 | 2.40 |
| Porcupine Crown | 1.00 | 1.25 |

## TORONTO MARKETS.

July 24th—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 5½ cents per pound.
- Lead, 5.40 cents per pound.
- Tin, 45 cents per pound.
- Antimony, 10 cents per pound.
- Copper, casting, 15¼ cents per pound
- Electrolytic, 15½ cents per pound.
- Ingot brass, 11 to 15 cents per pound.

July 24th—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto)—
- Summerlee No. 1, $26.00 (f.o.b. Toronto).
- Summerlee No. 2, $25.00 (f.o.b. Toronto).
- Midland No. 1, 19.20 (f.o.b. Toronto).
- Midland No. 2, $19.00 (f.o.b. Toronto).

July 24th—(Quotations from Elias Rogers Co., Ltd., Toronto)—
- Coal, anthracite, $7.50 per ton.
- Coal, bituminous, $5.00 per ton for 1¼-inch lump.

## GENERAL MARKETS.

July 22—Connellsville coke (f.o.b. ovens).
- Furnace coke, prompt, $2.50 to $2.60 per ton.
- Foundry coke, prompt, $2.85 to $3.00 per ton.

July 22nd—Tin, straits, 41.30 cents.
- Copper, Prime Lake, 14.50 to 14.60 cents.
- Electrolytic Copper, 14.50 cents.
- Copper wire, 15.50 cents.
- Lead, 4.35 to 4.40 cents.
- Spelter, 5.40 cents
- Sheet zinc (f.o.b. smelter), 7.00 cents.
- Antimony, Cookson's, 8.40 to 8.50 cents.
- Aluminum, 23.00 to 23.50 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, ordinary, $46.00 per ounce.
- Platinum, hard, $51.00 per ounce.
- Bismuth, $1.95 to $2.15 per pound.
- Quicksilver, $39.00 per 75-lb. flask.

## SILVER PRICES.

| | New York. Cents. | London. Pence. |
|---|---|---|
| July 8. | 58⅛ | 26 9/16 |
| July 9. | 58⅜ | 26 15/16 |
| July 10. | 58¼ | 26⅞ |
| July 11. | 58⅜ | 26 15/16 |
| July 12. | 58¾ | 27 1/16 |
| July 14. | 58⅜ | 26 15/16 |
| July 15. | 58⅜ | 26 15/16 |
| July 16. | 58½ | 27 |
| July 17. | 58⅝ | 27 1/16 |
| July 18. | 59⅛ | 27¼ |

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

QUEBEC

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

ONTARIO

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

BRITISH COLUMBIA

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON AND NORTH WEST TERRITORIES

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

CANADA

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

QUEBEC

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

1202. Map 52A. Northeast part of the Serpentine Belt, Eastern Townships, Quebec. Geology. Scale 4 miles to 1 inch.

ONTARIO

750. Grenville Sheet. Parts of Counties of Ottawa, Argenteuil, Terrebonne, Two Mountains and Vaudreuil, Quebec and Carleton, Russell, Prescott and Glengarry, Ontario. Geology. Scale 4 miles to 1 inch. Reprint.

1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

1260-1276. Maps 74A-90A. Geology of the Forty-ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.

1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch.

1247. Map 69A. Route map of part of Nass River, British Columbia. Scale 8 miles to 1 inch.

1168. Map 30A. Mother Lode and Sunset mines. Geology and Topography. Scale 400 feet to 1 inch; contour interval 20 feet

1200. Map 50A. Part of Portland Canal Mining Area. Topography. Scale 2 miles to 1 inch; contour interval 200 feet.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

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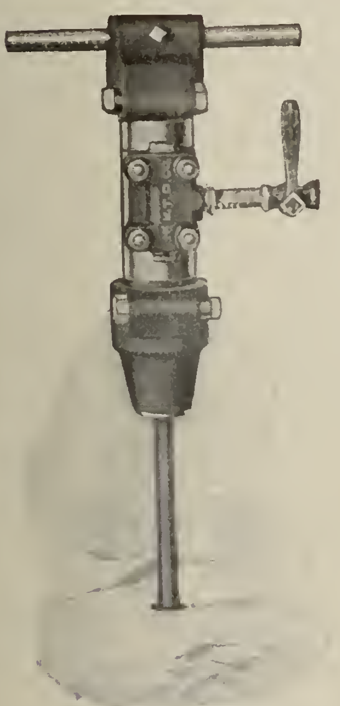
**It will pay you to investigate our line of McKiernan-Terry Wizard Rock Drills, with Cushioning Device and Corliss Valve, also**



96 lb. Shaft Sinking Hammer Drills.

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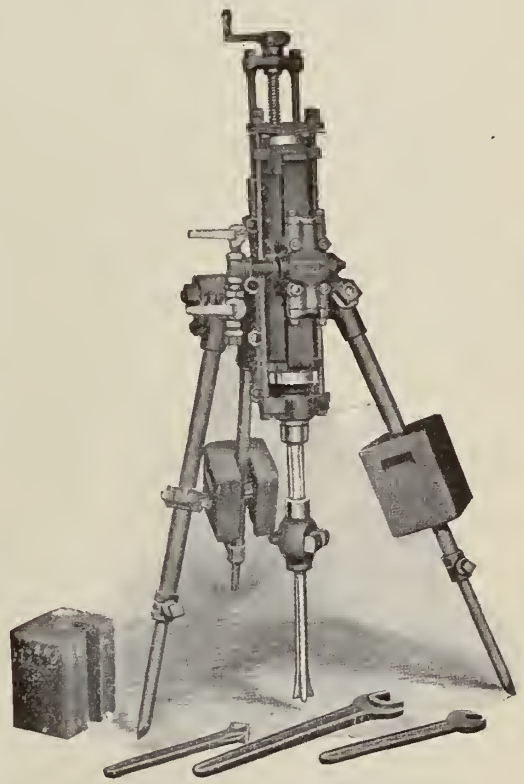

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LIMITED

# Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

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In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

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The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HON. W. H. HEARST,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**

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# The Canadian Miner's Buying Directory.

**Amalgamators—**
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Northern Canada Supply Co.

**Assayers and Chemists—**
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Peacock Bros.

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Northern Canada Supply Co.
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Milton Hersey Co.
Ledoux & Co.

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Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

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Mussens, Limited.
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Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
Mussens, Limited.
Northern Canada Supply Co.

**Condensers—**
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E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Converters—**
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.

**Conveyors—Belt—**
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Waterous Engine Works.
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Fraser & Chalmers, Ltd.
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Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Northern Canada Supply Co.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
Canadian Allis-Chalmers, Ltd
Standard Diamond Drill Co.

**Drills—Diamond—**
American Diamond Rock Drills.
Sullivan Machinery Co.
Northern Canada Supply Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.

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Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

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Waterous Engine Works Co.
Mussens, Limited.

**Dynamite—**
Curtis & Harvey (Canada), Limited.
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Northern Canada Supply Co.

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Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Ejectors—**
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Krupp, Fried. A. G., Germany.
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John McDougall Caledonian Iron Works.
Northern Canada Supply Co.
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Jenckes Machine Co.
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Peacock Brothers.

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Peacock Bros.

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Jenckes Machine Co.
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Jenckes Machine Co.

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Jenckes Machine Co.
Peacock Bros.
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**Engines—Oil—**
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**Engines—Steam—**
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E. Leonard & Sons.
Fraser & Chalmers, Ltd.
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Alex. Fleck.
Peacock Bros.
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Laurie & Lamb.
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Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

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Jenckes Machine Co.

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Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.

**Feeders—Ore—**
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Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.

**Filters—**
Krupp, Fried. A. G., Germany.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

**Forgings—**
M. Beatty & Sons.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Furnaces—Assay—**
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Lymans, Limited.
Mussens, Limited.

**Fuse—**
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Curtis & Harvey (Canada), Limited.
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Canadian Explosives.
Mussens, Limited.
Northern Canada Supply Co.

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John McDougall Caledonian Iron Works.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
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**Generators—**
Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.

**Girders—Steel—**
Dominion Bridge Co.

**Continued on page 36.**

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
Fraser & Chalmers, Ltd

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Northern Canada Supply Co.

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Peacock Bros.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
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S. Flory Mfg. Co.
Jones & Glassco.
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Jeckes Machine Co., Ltd.
M. Beatty & Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

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Mussens, Limited.
E. Leonard & Sons.
Peacock Bros.
Can. Fairbanks-Morse Co.
Siemens Co. of Can., Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

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Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Jenckes Machine Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
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Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
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Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

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Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried. A. G., Germany.
Orford Copper Co.
Canada Metal Co.

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B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

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Sullivan Machinery Co.

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Northern Canada Supply Co.
Thos. & Wm. Smith.
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Laurie & Lamb.
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Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
E. Leonard & Sons.

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Standard Diamond Drill Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
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Northern Canada Supply Co.

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Canadian Fairbanks-Morse Co
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E. Leonard & Sons.
Northern Canada Supply Co.
Smart-Turner Machine Co.
Peacock Bros.
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Fraser & Chalmers, Ltd.

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Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
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Thos. & Wm. Smith.
M. Beatty & Sons.
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Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
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Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
Canadian Fairbanks-Morse Co
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Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

**Pumps—Rotary—**
Canadian Fairbanks-Morse Co
E. Leonard & Sons.

**Pumps—Sinking—**
Canadian Fairbanks-Morse Co
Mussens, Limited.
E. Leonard & Sons.
Canadian Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
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E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A. G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.

**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd

**Roofing—**
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Peacock Bros.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Heys & Sons.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Bros.
Northern Canada Supply Co.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Canadian Allis-Chalmers, Ltd
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Canadian Allis-Chalmers, Ltd
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.

**Shovels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Deister Concentrator Co.
James Ore Concentrator.
Canadian Allis-Chalmers, Ltd
Chalmers & Williams.
Krupp, Fried. A. G., Germany.

**Smelting Machinery—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Canadian Allis-Chalmers, Ltd
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
Consolidated Mining & Smelting Co.

**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co., Ltd.
Peacock Bros.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbank-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Canadian Allis-Chalmers, Ltd
Siemens Co. of Can., Ltd.

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VOL. XXXIV TORONTO No. 16



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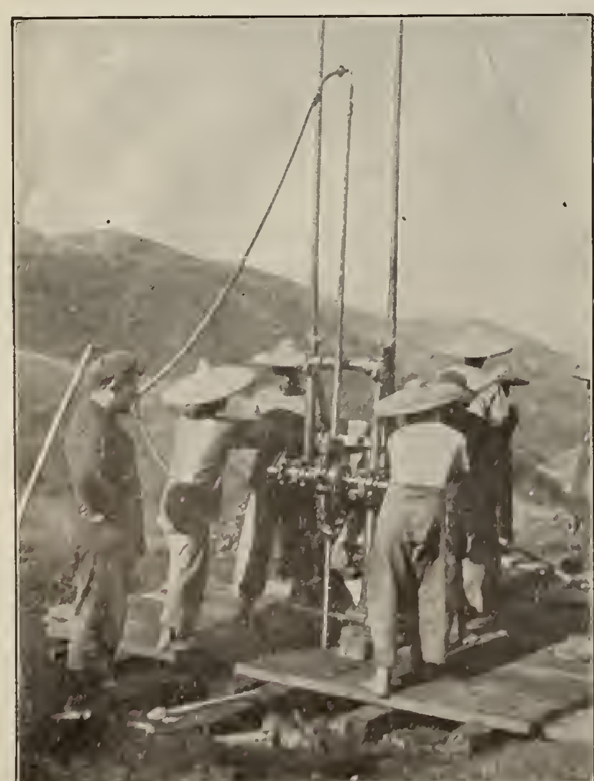

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# THE CANADIAN MINING JOURNAL

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CONTENTS.



## THE NICKEL INDUSTRY

A very timely report on the nickel industry, with special reference to the Sudbury region, prepared by Prof. A. P. Coleman, of the University of Toronto, has just been issued by the Mines Branch, Ottawa.

During the past few years the demand for nickel has greatly increased, and nowhere is this more evident than in the Sudbury district. The two large producers, the Canadian Copper Company and the Mond Nickel Company, report their business to be in a very satisfactory state. Large profits were made in 1912, and the present year finds the producers scarcely able to meet the requirements. The Mond Company has quite recently completed and put into operation at Coniston a splendid new smelting plant. The Canadian Copper Company last year completed the task of replacing its acid converters with large capacity basic converters, and put into operation a new reverberatory plant for the treatment of fines. This company has now well under way plans for largely increasing the capacity of the smelter.

A third company, the Dominion Nickel-Copper Company, has during the past two years been making very exhaustive exploration of some other properties and has discovered a large body of ore at the Murray mine. The company had made considerable progress with plans for a smelter. Changes of ownership have taken place lately, however, and the new owners have not yet made their intentions public. For the present the preparations for erection of a smelter have been postponed.

The successful operations of these three companies has made the Sudbury district take on new life, and the confidence evidenced by the directors in their last annual reports indicates that the industry will become much greater in the near future.

With the renewed interest in the nickel field, it is very fortunate that an up-to-date volume on the industry is now available. Some years ago Dr. Coleman prepared a report for the Ontario Bureau of Mines, in which he gave a remarkably clear idea of the structural features of the nickel deposits. During the past few years Dr. Coleman has been working in the district for the Canadian Copper Company, and later for the Department of Mines. The information gained has enabled him to produce an excellent revised monograph.

The monograph is accompanied by a general geological map of the district and special maps of the more important mines, the whole representing the advances made in knowledge of the region due to three summers' work in the field.

In addition to descriptions of all the known nickel ore deposits in Ontario, there are accounts of methods of mining and smelting the ores, and of the chief nickel regions of other countries.

In the preparation of the work Dr. Coleman was greatly aided by the mining companies. Information was freely granted by the several companies. The compiling of the accompanying maps and plans has been the work of Mr. R. B. Rose.

## VARIATIONS IN VALUES WITH DEPTH

It has been found by actual experience in mining metals in all parts of the world that ore deposits do not continue with undiminished value to very great depth. In many cases the productive portion has been found to be only that within a few hundred feet of the surface, and mines over 3,000 feet in depth are comparatively rare, though several very important deposits continue profitable to considerably lower levels.

Statements of regularity of decrease in values with depths are, however, often based on insufficient data. It is a common practice to point to the history of mining operations in a locality and call attention to the decrease in values as evidenced by gradually waning production, followed by closing down of the mines. We are then told that the values gradually fell off as the deeper levels were opened, and that there is probably no more ore at greater depth.

As a rule the assay plans, showing exactly where the values occur, are not made public, and the information gained by the operators is ultimately lost. It is, however, often possible to obtain sufficient evidence to show that the change in values with depth is not properly described as regular, that many deposits are richer at depth than at the surface, that the variations with depth are often not unlike the variations with lateral extent, that there is often a noticeable relation between length and depth, that many rich deposits do not outcrop, that there are probably ore bodies at depths far beyond the lowest levels yet reached by mining operations which are not known, simply because they do not outcrop, and that in glaciated areas there is often no good reason to postulate any close relation between the character of ore and the present surface.

To properly interpret figures giving production for successive years, and these are the figures most commonly available to the public, it is evidently necessary to know what portion of the deposit the ore was coming from. Where no assay plans are available, we have often, unfortunately, to assume a gradual deepening on the ore deposit; but even in these cases some information can commonly be obtained to show what portions of the mine were being most energetically worked each year.

As a rule, the first openings in a deposit are made in what is believed to be the central and best portion of it. As depth is attained, lateral extensions are made into the lower grade ore on either side. Without any change with depth the yearly records then show a decrease in values.

In most deposits the ore shoots pitch to right or left with depth. Shafts seldom follow the ore shoots, and if started in them get into poor ore long before the main shoot fails. Again the records show a falling off in values, which is not a true indication of the variation in the character of the deposit with depth.

In some cases, where one ore deposit has proven sufficiently rich to encourage mining to considerable depth, lateral exploration at low levels has resulted in the discovery of other ore deposits, which near surface are valueless, and which would have been undiscovered but for their proximity to a deposit which was rich enough near surface to permit of profitable mining.

One very essential feature to be noted in discussion of variations with depth is the change in character of formations in which the ore deposits occur. It is well known that very remarkable changes occur on passing from one formation down into a lower one. To discuss clearly the influence of depth then, it is evident that all deposits not confined to one series of rocks should be excluded, or that variations found wholly within one series be considered. If this is done, it is found that the general statements regarding decrease with depth in many cases find little support.

In Ontario and the Lake Superior States most of the valuable ore deposits occur in very old rocks which have been deeply eroded and then glaciated and more or less covered with glacial or fluvio-glacial deposits. It is quite unlikely that these deposits have, except for some very minor surface alterations, any close relation with the present surface. There is very good reason to believe that the deposits were formed in Pre-Cambrian or Cambrian times, in rocks that were not at the then surface. They have been exposed later by erosion, which continued down through long geological ages. It is incredible that the depth of such erosion has been in any way influenced by, or bears any close relation to, such minor masses as those which constitute our ore deposits, and on the other hand there is little evidence that the deposits have been much changed since they were exposed. The exposed surface is rather comparable to one which might be sliced off at any arbitrary depth. From general considerations, therefore, there is no good ground to place any reasonable limit on the depths at which ore deposits occur.

There is no necessary connection between the occurrence of ores at great depth below the present surface and the continuance of an individual ore shoot to similar great depth. The former is a probability, the latter has been proven by countless mining operations to be not the case.

# MICHIGAN COPPER MINERS STRIKE

On July 23rd, the Western Federation of Miners called a strike in the Lake Superior copper mining district, and since that date the copper country has been the scene of serious disorders necessitating the calling in of the State Militia. No immediate settlement seems likely, as neither union nor mine managers show any tendency to yield.

For several months the strike has been expected. The union has made no secret of its intention of taking advantage of the present shortage of labor in order to gain a foothold in the Michigan copper district. Previous efforts of the same kind have been flat failures.

It is stated that the demands presented ask for improvement in mining conditions, a minimum wage, recognition of the federation, and a change in operation of the one man drilling machines, the idea being to have an extra man for each two machines.

About 15,000 men are affected by the strike. About 16,500,000 pounds copper per month will be lacking in the production. The men will lose in wages about $1,000,000 per month, and very large amounts will be lost by those who are indirectly connected with the industry. The stockholders will lose an indeterminate large sum, which depends upon the price of copper.

On July 30th, Governor Ferris presented a plan to both sides to settle the strike; but this plan was not acceptable to the operators, who, however, said they were willing to meet committees provided the men came as employees and not as representatives of the Western Federation of Miners.

The less responsible element have been guilty of serious offences, sluggings have been of common occurrence, and an attempt has been made to prevent the operation of the pumps. This wanton damage to life and property naturally results in loss of sympathy for the strikers; but the organizers of the strike disclaim any responsibility for acts of violence. It is scarcely likely that they approve of such acts.

It appears that the strikers are for the most part Finns and Austrians, while Cornish, Irish and Italian miners are for the most part ready to go to work. Many of the Cornishmen returned to England some months ago, intending to stay away until the Federation and the Finnish socialists have settled their differences with the mine operators.

It is of course unlikely that the Federation should call a strike without a cause; but the accounts so far published make it appear that recognition of the union is the chief cause. The operators side of the case is presented in the following extracts from a message to Governor Ferris, bearing date of August 1st:—

"On the 23rd of July the strike called by the Western Federation of Miners took place. It was and is under the direction of skilled and experienced strike leaders of the federation, who are not residents of this district, or of this State. The strike took out only those affiliated with that organization on the morning when it went into effect. Many of our employees continued at work during the day.

"A campaign of violence and riot was at once instituted.

"The officers of the counties were without power to maintain order or to restrain lawlessness.

"By threats publicly made, including threats of destruction of their homes in their absence, violence to their families and death to themselves, the men of the night shift were deterred from going to work underground.

"Mechanics and labourers were driven from their employment by riotous mobs, armed with firearms, clubs, rocks, iron bars and other weapons. Mechanics, miners and labourers who desired to work or while at work, were cruelly beaten, and many were severely injured.

"The officers of the law were helpless, derided, cursed and their authority ignored.

"A deputy sheriff's star was a signal for an attack on the wearer.

"Officers were assaulted and beaten.

"The men were driven from the pumps and the mines were flooded with water, causing great destruction and damage.

"At some of the mines, even the operations of pumps for the fire protection of the community was forcibly prevented and the men driven out.

"At every branch of the mining industry at the several mining locations, the labor of the employes willing and anxious to work, was stopped forcibly, riotously, by threats and intimidation, by violence and assault, by woundings and beatings.

"There was no call by these strikers for conference, or for mediation or for adjustment while they thus completely dominated the situation.

"There is therefore no industrial dispute between the mine owners and employes. Under the circumstances, and because of our knowledge that the majority of our employes have at no time sympathized with the purpose of the federation, and have been and are now willing and anxious to continue in their employment, we cannot recognize the right of the Western Federation of Miners to intervene or to assume to represent our employes with respect to the present conditions, or in any other manner whatsoever."

It is regrettable that the outlook for a settlement seems far removed. The miners and their families are not in a position to stand a long period of enforced idleness, and to many of them even the loss of a few days' wages is a very serious matter. Those who wish to work should be allowed to work, and the State must be responsible for their protection. The stand taken by the operators seems likely to result in a deadlock until the miners are ready to discuss their grievances as employees rather than as members of the union.

# INTERNATIONAL GEOLOGICAL CONGRESS

## SUDBURY-COBALT-PORCUPINE EXCURSION.

On Wednesday evening, July 23rd, 45 members of the Congress left Toronto on a special C. P. R. train to visit the mining districts of Northern Ontario. The excursion was very well arranged, and, from start to finish, proved very interesting. Some of the places visited have become widely known, both on account of their commercial importance and on account of their scientific interest. The structure and origin of the ore deposits has proven an attractive subject to many geologists, and it was a pleasure much appreciated by the visitors to have the characteristic features of the several deposits pointed out to them by men who have made a special study of the several districts.

All over the world the Sudbury deposits are referred to as the most notable example of that particular type of ore deposits supposed to be the result of magmatic differentiation. It was therefore of special interest to have the features of these deposits pointed out by Dr. A. P. Coleman, who has made several years study of the deposits and has long contended that the ore bodies have been formed by segregation of the sulphides from a molten magma which was chiefly composed of the constituents of norite—the rock in which the ore occurs.

The members found little difficulty in finding hand specimens which show apparently secondary deposition of sulphides, especially of chalcopyrite; but as has already been mentioned by exponents of the magmatic theory, this secondary deposition is of minor importance, as the localization of the ore bodies seems to have depended on phenomena of much greater magnitude. The secondary deposits may easily have been formed by local changes within the original massive ore bodies and the neighbouring rock.

**The Sudbury Norite.**—Prof. Coleman first took the party to outcrops near Sudbury and pointed out several exposures of the Sudbury series—McKim graywacke and Ramsay lake quartzite—and the overlying conglomerate. Then, going to Windy lake on the C. P. R. Railway, the rocks which underlie the nickel bearing eruptive were seen. The railway was followed southeastward, giving a section across the eruptive. It was easily seen that the rock becomes, towards the upper and inner edge, lighter coloured and more siliceous. At the outer lower edge it is a dark gray, fine norite. This gradually changes to a coarser-grained rock containing less pyroxene and more reddish feldspar and micropegmatite. At the top it is quite red and siliceous and granite-like in appearance.

Below the nickel-bearing eruptive the rocks are much brecciated. In the vicinity of Sudbury several outcrops were visited and the "crush conglomerate" examined. Prof. Coleman, in calling attention to these outcrops, stated that this is characteristic of the foot-wall rocks all the way around the nickel range. Apparently the intrusion of the norite mass has been accompanied by very extensive crushing of the underlying rocks.

**The Inner Basin.**—Above the nickel-bearing eruptive there is a fine grained siliceous rock, which Dr. Coleman says is characteristic of the whole basin. Outcrops of this material were examined and it was found difficult to distinguish between the acid edge of the micropegmatite and what Dr. Coleman believes to be fused conglomerate.

**AT WINDY LAKE, SUDBURY DISTRICT**

A. W. G. Wilson, Ottawa; W. G. Miller, Toronto; A. C. Lane, Tufts College; Bedford McNeill, London; A. P. Coleman, Toronto; J. B. Tyrrell, Toronto; P. P. Piatnizky, Russia; Jules Szadeczcy, Hungary; A. G. Charleton, London; A. G. B. Wilbraham, London; G. W. Grabham, Khartoum, Africa; A. G. Burrows, Toronto.

Dr. Coleman stated that unaltered conglomerate and micropegmatite are not found in contact, but that in going from the overlying, Trout lake, conglomerate towards the eruptive there is always noted a gradual change from a distinctly fragmental rock to a fine-grained hard rock, which cannot be readily distinguished from felsitic igneous rocks. The change is so gradual that the conclusion reached is that the eruptive has intruded the conglomerate and was at a high enough temperature to alter it very extensively before solidifying.

Above the conglomerate is a dark coloured siliceous rock known as the Onaping tuff. Good exposures of this were examined at Onaping falls. At Onwatin lake outcrops of the overlying Onwatin slate were examined. It was found by several of the party that these rocks are specially productive of red raspberries. Asked as to the possibility of the Trout lake conglom-

**NEAR WINDY LAKE, SUDBURY DISTRICT**

C. W. Knight, Toronto; P. Piatnizky, Russia; J. B. Tyrrell, Toronto; G. W. Grabham, Khartoum; G. A. J. Cole, Dublin, Ireland.

erate, which overlies the nickel-bearing eruptive, and the basal conglomerate near Ramsay lake, being of the same age, Dr. Coleman replied that he considers this improbable. He stated that all around the inner basin the Trout lake conglomerate occurs and is always of the same character—a dark gray, hard conglomerate characterized by numerous pebbles of gray chert. He pointed out that the Ramsay lake conglomerate is quite different in appearance and composition and was probably not formed at the same time.

Having made examination of the several types of rock and of exposures which show their structural relations, visits were then made to the nickel mines.

**Murray Mine.**—The first mine visited was the Murray. This property, which is on the main line of the C. P. R., and was discovered by the building of the railroad, was worked several years ago; but has not been producing for ten years or more. During the past two years, however, the property has been systematicall prospected by diamond drilling and excellent results obtained. According to Mr. Hitchcock, who is in charge of the drilling operations, holes are being put down vertically at intervals of 200 feet and several million tons of ore has been discovered. The deposits worked in the early days are said to have dipped at about 45 degrees; but the drilling indicates that the

**AT SUDBURY**

J. A. Dresser, Sault Ste Marie, Ont.; G. Merciai, Pisa, Italy; E. Mattirolo, Torino, Italy; F. H. Forest. Rigaud, Quebec.

large body of ore penetrated by the drills dips at a considerably lower angle.

The Dominion Nickel Co. has done about 90,000 feet of drilling at the Murray and other properties in the Sudbury district in the past two years. About 20,000 feet of this was done at the Murray.

Having found a large body of ore the company employed a staff of engineers to work out methods of mining and treating the ore. Quite recently there has been a change in ownership and the property is now supposed to be under control of Dr. A. F. Pearson and associates. At present it is being operated under the names of the trustees of the property. Plans for the smelter are well advanced; but the owners have decided not to go ahead with the construction for some time.

According to Dr. Coleman, the nickel ore body at the Murray is now known to reach a depth of 1,100 feet and to include more than 10,000,000 tons. Several holes are being drilled to explore the deposit at greater depth.

**AT SUDBURY**

**A. G. Charleton. Past-President Institution of Mining and Metallurgy.**

**AT SUDBURY**

**Dr. A. C. Lane and Prof. J. Barrell discussing the grain of rocks.**

After pointing out the extensive gossan outcrops, Dr. Coleman led the party to exposures of the underlying rocks. The norite rests on a complex of ancient lavas showing in places, amygdaloidal and pillow structures.

**Creighton Mine.**—The following day was spent at the mines and smelting plant of the Canadian Copper Company. First the Creighton mine was visited. Dr. Coleman led the party past the open pit to an outcrop east of the mine, where is shown a characteristic contact of norite with the older gneiss. At the open pit the foot-wall rocks, the ore, the norite and a dike of diabase which cuts the ore were examined. The ore forms a somewhat pear-shaped body dipping to the north and pitching to the west. The mine is at present by far the largest producer of nickel in the world; but it will be far surpassed by the No. 3 mine. The Creighton is being mined as an open pit to the depth of 300 feet and underground mining is being done at lower levels. On returning to the train the party were presented with copies of a well-illustrated booklet describing the company's plants and methods, and with fobs of monel metal and specimens of pentlandite—the mineral which yields the nickel.

**Roast Yards.**—Leaving the Creighton mine, the party next went to Copper Cliff. The train was stopped in the roast yards and the burning piles of ore were examined, while members of the Company's staff explained the process of roasting.

**Offset Deposits.**—Dr. Coleman then led the party to exposures on the east shore of Macdonald lake, where a typical "offset deposit" was seen and trace southward to No. 2 mine. It was pointed out that the basic edge of norite narrows to a funnel leading to the long and important Copper Cliff offset, passing through granitoid gneiss, greenstone and graywacke. No. 2 mine, with its open pit 300 feet deep, is a typical columnar offset deposit.

The Copper Cliff mine is not now working, but was one of the richest of the early mines. The ore body

**Waiting for the special train at Levack. Mr. Bedford McNeill in contemplative mood.**

**DR. COLEMAN DESCRIBING STRUCTURAL FEATURES AT CREIGHTON MINE**

Mr. and Mrs. J. B. Tyrrell, Toronto; A. G. Charleton, London; Miss Eubank, Toronto; G. A. J. Cole, Ireland; Dr. Coleman, Toronto; O. F. Pfordte, Cairo, N.Y.; G. Merciai, Italy: A. E. Kitson, Gold Coast, West Africa; C. W. Knight, Toronto; S. Cerulli-Irelli, Italy.

formed an irregular chimney, which has been followed for 1,300 feet on an incline of 70 degrees to the east.

**Canadian Copper Company's Smelter.**—In the afternoon the guides took the party over the smelting plant and explained the process of treating the ore. This was described in detail in the August 1st issue of the Journal.

**No. 3, or Frood Mine.**—Leaving the smelter the party proceeded by train to Frood and examined the enormous outcrops of gossan at what is believed to be by far the largest nickel deposit yet discovered. According to Dr. Coleman, it is estimated to contain at least 35,000,000 tons of ore, and perhaps as much as 100,000,000 tons. From No. 3 the gossan-covered ridge extends almost unbroken for a mile to the southwest and almost as far to the northeast, where the Stobie mine once produced more than 400,000 tons of ore.

The deposit is being developed from two shafts on the property of the Canadian Copper Company. On adjoining property the Mond Nickel Company is sinking a vertical shaft, which is expected to reach the ore at a depth of about 800 feet.

At No. 3 mine the deposit has been developed for some distance at the 200 and 300-foot- levels. At the 200-foot level ore is being stoped by widening out crosscuts on reaching the ore and gradually extending the stope by making a fan-shaped opening, as has been done at some of the other properties.

**OPEN PIT, CREIGHTON MINE, CANADIAN COPPER COMPANY**

Supt. Kaeding; Fred Searls, Goldfield, Nevada; F. L. Ransome, U.S.G.S., Washington, D.C.

**ON OUTCROP OF CONTORTED IRON FORMATION, MOOSE MT., ONT.**

C. V. Corless, Mond Nickel Co.; F. A. Jordan, Moose Mt. Ltd. and Dr. J. F. Kemp, Columbia University.

At the 300-foot level a very different mode of attack is planned. Crosscuts through the ore body are being run at intervals of 50 feet. From the crosscuts inclined raises will be put up at intervals of 30 feet on each side, staggered at 15 feet.

The ore at No. 3 mine differs considerably from that at the Creighton. It is not commonly massive sulphide; but has a distinctly spotted character. The sulphide minerals occur as grains distributed with a regularity equal to that of the silicate minerals.

The orebody is more regular in shape than that at Creighton. It is a thick tabular mass dipping rather steeply at surface and, so far as can be told from drilling, flattening somewhat with depth.

While No. 3 ore is considerably lower grade than Creighton ore, the deposit is expected to prove even more valuable on account of its greater size.

**Entertainment by Sudbury Board of Trade.**—After returning to Sudbury on Friday evening, the members assembled in the Town Hall to partake of a supper given under the auspices of the Sudbury Board of Trade. A lengthy toast list kept the party up late in spite of Dr. Coleman's earnest requests to the speakers to be brief. It was generally conceded that Prof. Coleman made the speech of the evening when in response to a toast to the ladies he said: "The ladies are asleep. God bless them." Speeches of welcome to the visitors and of thanks to the Board of Trade and citizens of

Charging a basic converter at new smelter of the Mond Nickel Company at Coniston, Ont.

Sudbury for a splendid reception were received with much applause.

**Moose Mountain.**—Saturday morning the party was taken over the Canadian Northern Railway to Moose Mountain. Here the iron ore deposits and associated rocks were examined. At No. 1 mine, which is worked largely as an open pit, the ore is magnetite more or less interbanded with hornblende and green epidote. At No. 2 mine the ore consists of interbanded magnetite and silica without hornblende or epidote.

The ore mined is crushed and then concentrated by magnetic separation. By this means a marketable product is obtained. Much of the ore runs only 35 to 40 per cent. iron; but by a simple treatment the grade is brought up to 60 per cent.

In the vicinity of the mines many interesting structural features are well exposed. In places the banded ore is cut by dikes of granite and by thin seams of epidote. Where the iron formation crosses the Vermilion river interesting crumplings and foldings of the banded ore were pointed out by Dr. Coleman. A variety of interesting small scale structural features, such as anticlines, synclines and faults were also seen in the old rocks.

Recently Mr. Lindeman of the Department of Mines has been studying the district and has prepared a magnetometric map of the iron formations. Copies of this map were received just in time for distribution to members of the excursion.

After visiting the outcrops and mines, the party was conducted through the concentration plant and the methods of magnetic separation and briquetting of the ore were explained.

The officers of the company then entertained at a luncheon in the schoolhouse. A good meal, nicely served by the ladies of the village, was followed by several happy speeches. After luncheon a start was made southward. At several points the train was stopped to allow examination of outcrops along the railway. At Garson lake several of the party showed more interest in the water than in the rocks, and by general consent a stop was made to permit of a more intimate acquaintance with the lake. Refreshed by a swim, the party was then taken to the Coniston roast yards and smelter.

**At Coniston** the Mond Nickel Company has recently constructed a very complete smelting plant for the treatment of nickel-copper ores, and much interest was shown in the methods of handling the ore and furnace products here. The officers of the company conducted parties through the plant and explained the processes. Several labour and heat-saving devices have been introduced in the new plant.

In the evening the party returned to Sudbury, and on Sunday afternoon the train pulled out for Cobalt and Porcupine.

(To be Continued.)

## MARITIME PROVINCES EXCURSION.

### Visit to the Sydney Coalfield.

Cape Breton Island, within the past few years, has been visited during the summer months by many associations and congresses, and bodies of persons joined together for some ostensibly educative purpose. These parties have curiously coincided with hot weather in other parts of the American continent, and it has been shrewdly surmised that a desire to feel the cool Atlantic breezes was not altogether unconnected with the presence of these gatherings in Cape Breton, and there has been a feeling that business was sometimes interfered with unnecessarily in receiving and entertaining the visitors, for it is in the summer time that the coal mines and steel works are most busy, and interruptions are sufficiently numerous without further additions.

A pleasing exception, however, is the recent visit of a portion of the International Geological Congress to the Sydney coalfield. The geologists who composed this party were very evidently not on a junketing excursion, and the inspection of any undeveloped country by a discerning and well-informed party of specialists such as made up the Maritime Provinces excursion of the Geological Congress, cannot but be followed by an increasing interest in its resources and a more exact knowledge of its geological characteristics.

The Sydney trip commenced on Wednesday, the 23rd of July, with a visit to the Point Edward limestones, where the party inspected Limestone Point. Here the bedded limestones are seen dipping under the northwest arm of Sydney Harbour, and can be observed to disappear under the Millstone Grit on the other side of the arm. Several of the party evinced considerable interest in a curious appearance shown by weathered fragments of the limestone, the surface of the rock being covered by closely packed circular knobs showing a distinct concretionary structure. One learned gentleman remarked that the rock had "a curious botyroidal structure resembling sheep's brains." More may be heard of this, when the specimens reach Europe! An old quarry, known as Louisburg Quarry was next visited, which is said to have furnished lime for the French fortifications at Louisburg. Here numerous shell fossils were to be seen and further nodular specimens. The Nova Scotia Steel Company's quarries at Point Edward Post Office were then visited, where the full bench of the bedded limestone was exposed in working face. The limestone bed was covered with from ten to twenty feet of reddish drift, and in some places the top of the limestone was curiously water-worn.

Taking the ferry steamer at Leitches Creek, the party sailed down the Northwest Arm and landed at the Quarantine station on Point Edward, about on the axis of the anticline, which divides the two arms of Sydney Harbour. Here an exposure of black shale was visited that yielded a large number of small fossil fauna, particularly the minute fossil shell Leaia. One of the German geologists picked up from the underlying sandstones a fine specimen of a fish-spine about eight inches in length, and a compatriot was the proud possessor of a slab of sandstone showing a well defined cast of mud-cracks arranged in rough pentagons over its lower surface. The black-shale bed occurred just about breast-high, and in a favourable position for attack. An interesting photograph might have been had of some forty persons ranged in a continuous row vigorously attacking the crumbling shale with their hands, and all, apparently, well pleased with their finds.

From Point Edward the geologists proceeded to North Sydney, landing there and taking the tram-car to the point where the Millstone Grit, said to be here over 3,000 feet in thickness, gives place to the true Coal Measures. The party descended the cliffs and walked at the base as far as the outcrop of the Sydney Main Seam. Several members of the party preferred the highway to the rocky base of the cliffs, remarking that they had seen Millstone Grit before; but by the time coal-bearing measures were reached the whole party were interested examiners. The coast section between North Sydney and Sydney Mines is an imposing one, and probably ranks next in interest to the Joggins exposure, which the party expected to see in the following week. Some magnificent specimens of fossil trees were to be noticed. One Sigillaria in particular was in an ideal position for inspection at the base of the cliff. It was 2 feet 7 inches across the base, and about four feet of the trunk was exposed, the remainder being hidden in the overhang of the cliff. The carbon envelope, always present around fossil plants in the coal measures, enclosed the trunk completely, passing between the base and a small seam of impure coal, on top of which the trunk had apparently been deposited uprightly. The position of the fragment and its surroundings was evidence of the quiet conditions under which it must have been deposited. The trunk was finely marked with the characteristic flutings and pits of the Sigillaria. In several other places at the top of the cliff, where the marls had crumbled under the action of the waves and the atmosphere, there were visible a number of semi-circular shafts where the fossil trees had been, but had fallen out. Near the outcrop of the Sydney Main Seam was a wealth of fossil remains. At least a dozen large and well-preserved specimens of Sigillaria, Lepidodendra and Calamites were to be seen within a space of two yards.

The shale bands in close proximity to the coal seams were found rich in small shell specimens, among which were noticed ostracods, anthracosia (or carbonicola, as it is now the fashion to term this variety), anthracomya and naiadities. Fish scales were also to be found and the delicate iridescent shell estheria. Various ferns and such forms as asterophyllites and sphenophyllum were present in considerable numbers, but the geologists appeared to be more particularly taken with the shell horizons.

A fairly good idea of the nature of the strata overlying the coal seams in the submarine areas can be obtained from an inspection of the cliffs. The colouring is in places very pretty. A variety of shades characterize the marls, red, green, blue, purple, grey and black all being visible. A characteristic of the mudshales is a star-like marking, such as might be occasioned by the splashing of a stone into mud or soft clay. Numerous lines can be seen radiating from a central point, that is usuallly a lighter colour than the surrounding shale, being evidently the decomposed remains of a root with its surrounding rootlets, seen end-on to the observer. In some places a longitudinal section of such a root could be seen. In a rock at the base of a cliff washed by the tide could be seen a stigmaria, extending for five to six feet in length, with rootlets in situ.

After walking along a portion only of the Sydney mines exposure, one appreciated the industry of the late R. H. Brown, who measured the vertical depth of these measures from end to end of the Sydney coalfield, and sketched with excellent precision the whole shore exposure from North Sydney to Cranberry Head. A comparison of Mr. Brown's sketches, made in 1870 or thereabouts, with the exposure as it is to be seen to-day would be interesting.

After reaching the crop of the Sydney mine seam the party left the cliffs and regained the highway, proceeding to Sydney, which completed the first day's work. The conversation in the crowded tram car was very cosmopolitan. A gentleman from Holland was to be heard explaining in halting French to a group of Frenchmen the customs of the natives of Java and Batavia. On the opposite side an Austrian was relating a college story to a German, and close by was an interesting Japanese gentleman from Dairen, Manchuria, who said little but missed nothing.

On the second day the party divided into four groups—one group going to the Princess pit of the Nova Scotia Steel and Coal Company, Sydney Mines, a second group to the works of the Dominion Iron and Steel Company at Sydney, a third group to No. 2 Colliery of the Dominion Coal Company, while a small party visited the old French fortifications at Louisburg. Your correspondent can only detail the journeyings of the party who visited No. 2 Colliery. The Rescue Station was visited, and a group of trained men wore the Draeger apparatus for the benefit of the visitors, who were also shown the Pulmotor, electric lamps and other accessories of this well-equipped station. The superintendent of the station has for some time been accumulating fossils from the Glace Bay mines, chiefly flora, and these were also shown to the geologists. Some large and excellent specimens of the predominating tree and fern fossils were in the collection, including a really fine sigillaria, five feet long by eighteen inches wide, and the only specimen of Bothodendron punctatum your correspondent has known to be discovered in the Sydney field.

From the Rescue Station a portion of the party visited Table Head, and what is popularly known in Glace Bay as the Burnt Mines. In reference to this vicinity, Mr. Brown's book quotes from the memoirs of M. Pichon, the secretary of the French Governor of Louisburg, who relates in his history of Cape Breton, published in 1760, that "the English had a coal pit at Burnt Head, defended by a fort of considerable strength, where, with fifty men, they successfully repulsed the attacks of the savages and kept possesssion of the fort." M. Pichon further relates that the pit took fire in 1752, when the fort was also entirely consumed. Traces of this fire may still be seen along the outcrop of the Hub seam, and in places the heat of the burning coal has changed the shale cliffs into masses of slag.

The party of geologists were informed that they were standing approximately in the centre of the trough of the Glace Bay synclinal basin, and that beneath their feet were at least seven workable coal seams, aggregating thirty-nine feet of coal, in the comparatively shallow depth of 1,300 feet of strata. They were also told that seaward there was, for all practical purposes, an illimitable supply of submarine coal. One gentleman, whose name is not altogether unknown in Canadian geology, confessed that the day being fine and the air salubrious, he had lain down on the grass and betaken himself to sleep.

While one portion of the party was inspecting the Burnt Mines, the other portion had descended No. 2 shaft and seen the unique weighing and hoisting arrangements in the Phalen pit bottom. Many questions were asked of those who accompanied the party, but none more incisive than those of Mr. Kido, of Manchuria, who insisted upon sketching everything that caught his fancy, and jotted down in his note book the names and addresses of the makers of the machinery.

In the afternoon the scattered parties gathered together and were the guests at lunch of the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company. On the following day the party proceeded to inspect the limestone quarries on the George's River limestone series, from there to Antigonish and thence to the shale cliffs at Arisaig. F. W. G.

# CONGRESS PERSONALS

Dr. A. E. Barlow

Wladimir Loewinson-Lessing, of St. Petersburg, Russia, is one of Europe's leading geologists, and stands foremost among the Russians. He is an authority on rocks and the author of several papers.

John Walter Gregory is one of England's leading mining geologists. He was for some years professor of geology at the University of Melbourne and director of geological surveys of Victoria. He has studied the mining fields of several countries, and is the author of several papers on mining geology, including Mount Lyell mines, Victoria gold and tin fields, Ballarat gold field, South Rhodesian gold fields, etc.

Edward O. Ulrich, geologist, U. S. Geological Survey, is one of America's leading paleontologists. He has studied especially stratigraphy and invertebrate paleontology.

Walter Harvey Weed, consulting geologist and mining engineer, New York City, is one of the most prominent mining geologists in America. He has mapped several mining districts for the U. S. Geological Survey, and has contributed numerous articles on the origin of ore deposits. His writings include reports on geology of Mexico, coal of Montana, copper deposits of Butte, and copper mines of the world.

Waldemar Lindgren, professor of geology, Massachusetts Institute of Technology, is one of the foremost authorities on metalliferous deposits. He has made many valuable contributions to the literature on gold, silver and copper deposits, especially on the gold deposits of Colorado and California and the copper deposits of Clifton, Arizona.

Dr. Charles Kenneth Leith, professor of geology, University of Wisconsin, is a prominent authority on the geology of the iron districts of the United States. With Dr. Van Hise he has made careful study of the Lake Superior district, and has done much towards determining the structure of the ore deposits and their origin.

Dr. Frederick Leslie Ransome is chief geologist of the U. S. Geological Survey. He is a native of Greenwich, Eng., and a graduate of California University. He has taught mineralogy at Harvard and geology at Chicago University. He joined the staff of the U.S.G.S. in 1897, and has written for the Survey several important works. His special studies have been the geology of gold, silver, lead, and copper deposits in Western United States.

William Herbert Hobbs, professor of geology, University of Michigan, makes a specialty of structural and dynamical geology and seismology. He has a reputation as a fault-finder. Dr. Hobbs has published numerous articles on mineralogy, petrography and geology, and is the author of books on earthquakes and general geology. He is an authority on the fracture systems of the earth's crust.

Dr. Charles Doolittle Walcott, Secretary of the Smithsonian Institution, Washington, D.C., ranks among the leading geologists of the world. He has made a special study of the oldest fossiliferous formations, and he has written numerous volumes on the stratigraphy and paleontology of the Paleozoic rocks. Dr. Walcott has done some very valuable work in the Canadian Rockies and has given remarkable descriptions of them. After being for several years on the staff of the U. S. Geological Survey, Dr. Walcott was appointed director of the survey in 1894. This position he held until 1902, when he joined the reclamation service. In 1907 he was appointed secretary of the Smithsonian Institution.

Louis V. Pirsson, professor of geology, Yale University, is one of the most prominent American geologists. He has described the geology of several of the districts of central Montana and of parts of New Hampshire. Dr. Pirsson has made a special study of rocks and rock minerals, and has published a text book on petrology.

Dr. Richard Beck

**Dr. Charles P. Berkey**

Dr. Fred E. Wright has made an especial study of microscopic methods and the microscopic properties of minerals and artificial products, made in the Geophysical Laboratory, Washington. He was formerly instructor in petrography at the Michigan College of Mines and Assistant State Geologist of Michigan.

Dr. Alfred C. Lane, Professor of Geology Tufts College, Mass., and formerly State Geologist of Michigan, is an authority on Michigan copper mines. He has published numerous papers on economic geology. He has made a special study of mine waters and the grain of igneous rocks. Dr. Lane is a graduate of Harvard and Heidelberg. He was instructor in mathematics at Harvard and later taught geology in the Michigan College of Mines. He was State Geologist of Michigan, 1899-1909.

Bedford McNeill, consulting engineer, London, Eng., is well known as author of "Bedford McNeill's Code," published in 1893 and 1908. He has inspected and reported on numerous mines in Germany, Transylvania, Colorado, Georgia, and Mexico, and has been consulting engineer to Anchor T. Mine, Ltd., Bacis Gold and Silver Mining Co., Ltd., Waterson Gold Mining Co., Ltd., etc. Mr. McNeill has long been a prominent member of the Institute of Mining and Metallurgy, and is now president.

John W. Evans, delegate of the Geologists' Association, London, Eng., was in 1891-92 geologist and mineralogist to the Matto Grosso Gold and Exploration Concessions in Brazil. Later he became State geologist and chief inspector of mines and explosives, Mysore, India. In 1901-02, Mr. Evans traveled in the Eastern Andes and the lowlands of Bolivia and Matto Grosso and Amazonos, Brazil, for the Bolovian Syndicate. More recently he has been instructor in Economic Mineralogy to officers of the Colonial Service.

Albert E. Kitson, director of the Geological Survey of the Gold Coast, has made surveys and examinations in all the Australian States, Tasmania and New Zealand, and was for some time in charge of the Coal-Fields Survey, Victoria. Later he was Principal of the Mineral Survey, Southern Nigeria, British West Africa. Mr. Kitson conducted geological explorations and mining operations in Southern Nigeria and Dahomey. He has examined metal and coal mines in the British Isles, Germany, Austria and Italy, and repórted on lignite and its manufacture into briquettes.

Harry F. Bain, Editor Mining and Scientific Press, San Francisco, was for some time geologist on the Iowa State Survey. During the period 1901-03 he was manager of mines at Idaho Springs and Cripple Creek, Colo. After being for a few years geologist on the staff of the U. S. Geological Survey, he was appointed Director of the Illinois Geological Survey. This position he left in 1909 to take up editorial work.

J. B. Tyrrell, consulting mining engineer, Toronto, has taken a very prominent part in the development of the mineral resources of Canada. As geologist on the staff of the Geological Survey, 20 years ago, he explored the Rocky Mountains north of the International boundary. Later, in Alberta, he determined the source of gold in the Saskatchewan River, and located most of the coal seams in the province. In 1893 Mr. Tyrrell began the exploration of a great unknown region between the Mackenzie River and Hudson Bay. In 1898 he began the investigation of the geology of the Klondike goldfields and of other parts of the Yukon Territory. Later he resigned from the Geological Survey and practiced as mining engineer in Dawson, reporting on many large properties and engaging in mining on his own account. Mr. Tyrrell moved to Toronto in 1906.

Arthur George Charleton, Past President of the Institution of Mining and Metallurgy, was at one time assistant manager of Canadian Consolidated Gold Mines, Deloro, Ontario, and later of mines in Nevada. In 1884 he reported on Wynaad and Mysore Gold Fields, India. Then he became general manager of Disraeli Gold Mining Co., Queensland, and in 1888 of the new Queen

**H. F. Bain**

Dr. Waldemar Lindgren

Gold Mining Co. In 1895 he founded the firm of Charleton and Co., in partnership with F. W. Grey, reporting on mines of gold, copper, silver-lead, manganese and cobalt, in different parts of the world. In 1894 Mr. Arthur Dickinson joined the present firm, Charleton, Dickinson and Co., who acted as consulting engineers to the Cornish Consolidated Tin Mines, Ltd.; the Anglo-Spanish Copper Co., etc. Mr. Charleton is the author of numerous papers on mining, milling and mine accounting.

William Harvey Emmons is a native of Mexico, Mo. He was for several years on the staff of the Geological Department, University of Chicago. As geologist on the U. S. G. S. he studied and described many of the ore deposits of Nevada, Montana and Colorado.

Reginald Aldworth Daly, Professor of Geology, Massachusetts Institute of Technology, Boston, is a Canadian who ranks among the leading geologists of the United States. He has contributed many very important papers on the geology of igneous rocks and is regarded as a leading authority on the subject.

Dr. Edmund Otis Hovey, Curator of the American Museum of Natural History, has made a special study of volcanoes, meteorites and earthquakes. He has described the volcanoes of the Lesser Antilles and eruptions of Mount Pele, Martinique and the Soufriere, St. Vincent.

Alfred Harker, Fellow of St. John's College and Lecturer in Petrology, Cambridge, is well-known for his studies in petrology and for his text books on rocks. His work, "Petrology for Students" is in use in many colleges. Among his publications is an admirable work on the "Natural History of Igneous Rocks."

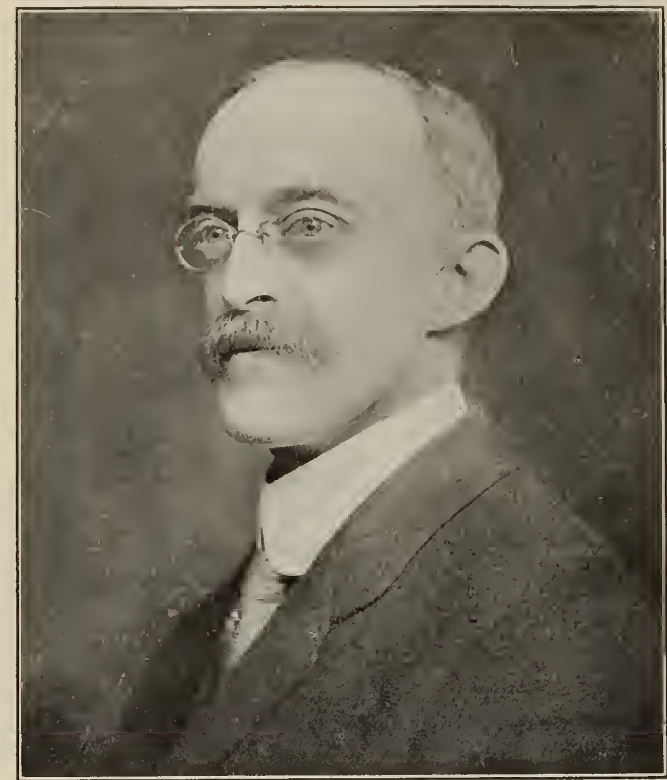
William Wallace Mein, Consulting Mining Engineer, New York, is well known in Ontario through his position as consulting engineer for the Dome Mines Co. and the Canada Exploration Co. Mr. Mein has held very important positions on the Rand, South Africa, being general manager of French Rand Gold Mining Co., Crown Reef, Robinson, Robinson Central Deep, Ferreira, Village Main Reef, Village Deep, Turf Mines, City Deep, New Modderfontein and Modderfontein Extension. In Alaska also Mr. Mein held important posts, being consulting engineer to Alaska Treadwell Group of Mines, Douglas Island, Alaska.

Dr. Florence Bascom, Professor of Geology at Bryn Mawr, Pa., enjoys the distinction of being the most prominent woman geologist in America. For several years she has been a member of the staff of the United States Geological Survey, and has written a number of valuable works on general geology and on the geology of Pennsylvania. Miss Bascom is a regular attendant at the meetings and excursions of the several societies to which she belongs. She took part in the last meeting of the Geological Congress in Sweden.

Professor Joseph Barrell of Yale University, New Haven, is a prominent authority on the origin of rocks. Of late he has written several illuminating papers on the importance of land-formed sediments among the old formations. Professor Barrell was, in 1893-97, instructor in mining and metallurgy at Lehigh University. After practising for two years as a mining engineer, and spending three years as United States geologist in Montana, he was, in 1900, appointed Assistant Professor of Geology at Lehigh. In 1903 he received an appointment at Yale and became professor in 1908.

Dr. Heinrich Ries, Professor of Geology, Cornell University, is the foremost authority on clays. He has made many valuable contributions to our knowledge of the clays of America. Dr. Ries has been engaged by the U. S. Geological Survey and by the State Surveys of Michigan, Maryland, New Jersey, Texas, Wisconsin and Virginia to report on clays. Recently he has done similar work for the Canadian Geological Survey.

Horace V. Winchell



**W. F. Ferrier**

Henry Shaler Williams, Professor of Geology, Cornell University, is a paleontologist who has made a special study of Devonian paleontology; geological history of organisms; evolution and geographical and geological modification of fossil faunas. He has published articles on changes in composition and modification of species in relation to change of location and succession in time as means of geological correlation and identification of their time relations.

Frank Leverett, Geologist, U. S. Geological Survey, is a leading authority on glacial geology, physiography and water resources. He has made numerous glacial investigations in the Upper Mississippi and Great Lakes regions. Mr. Leverett is lecturer on glacial geology, University of Michigan.

Horace Vaughn Winchell, Consulting Mining Engineer and Geologist, Minneapolis, is one of America's most prominent economic geologists. He makes a specialty of the determination of value and modes of extraction of ores and minerals. Mr. Winchell was, in 1889-91, Assistant State Geologist of Minnesota. He was then appointed Geologist in charge of explorations on Mesabi and Vermilion iron ranges for the Minnesota Iron Co. In 1893 he practised as consulting engineer and geologist and has been geologist (1898-1906) for the Anaconda Copper Co., and (1906-1908) for the Great Northern Railway Co.

### The Reception in Ottawa.

A luncheon tendered them at the Experimental Farm by the Government, at which they received an official welcome from Premier Borden on behalf of Canada, and the unveiling in the afternoon by Hon. T. W. Crothers of the tablet erected by the Congress in honour of Sir William Logan, founder of the Canadian Geological Survey, formed the features of the visit to Ottawa, August 1, of some 200 delegates to the International Geological Congress at Toronto.

Arriving in the city the previous night the delegates were taken around to see its sights in the morning and then conveyed to the Experimental Farm. In Auditorium Hall there luncheon had been arranged at which about 350 sat down. At its conclusion speeches were made by Rt. Hon. Mr. Borden, who just returned in time for the event; Controller Parent, President Frank D. Adams and other delegates hailing from many countries.

After welcoming the Congress to Canada, Premier Borden expressed his appreciation of the coming of so many distinguished gentlemen representing nearly all the civilized nations of the world; a visit which meant much to a country like Canada, still busy with its first problems of development. This country, in fact, was so large that just a few months ago the Government had sent an expedition north to find just how far its boundary extended in that direction. It was expected to be heard from in about four years' time. He hoped the visit would give the delegates a new idea of Canada's resources and that she might learn from them some things that would help her to solve the problems of the future.

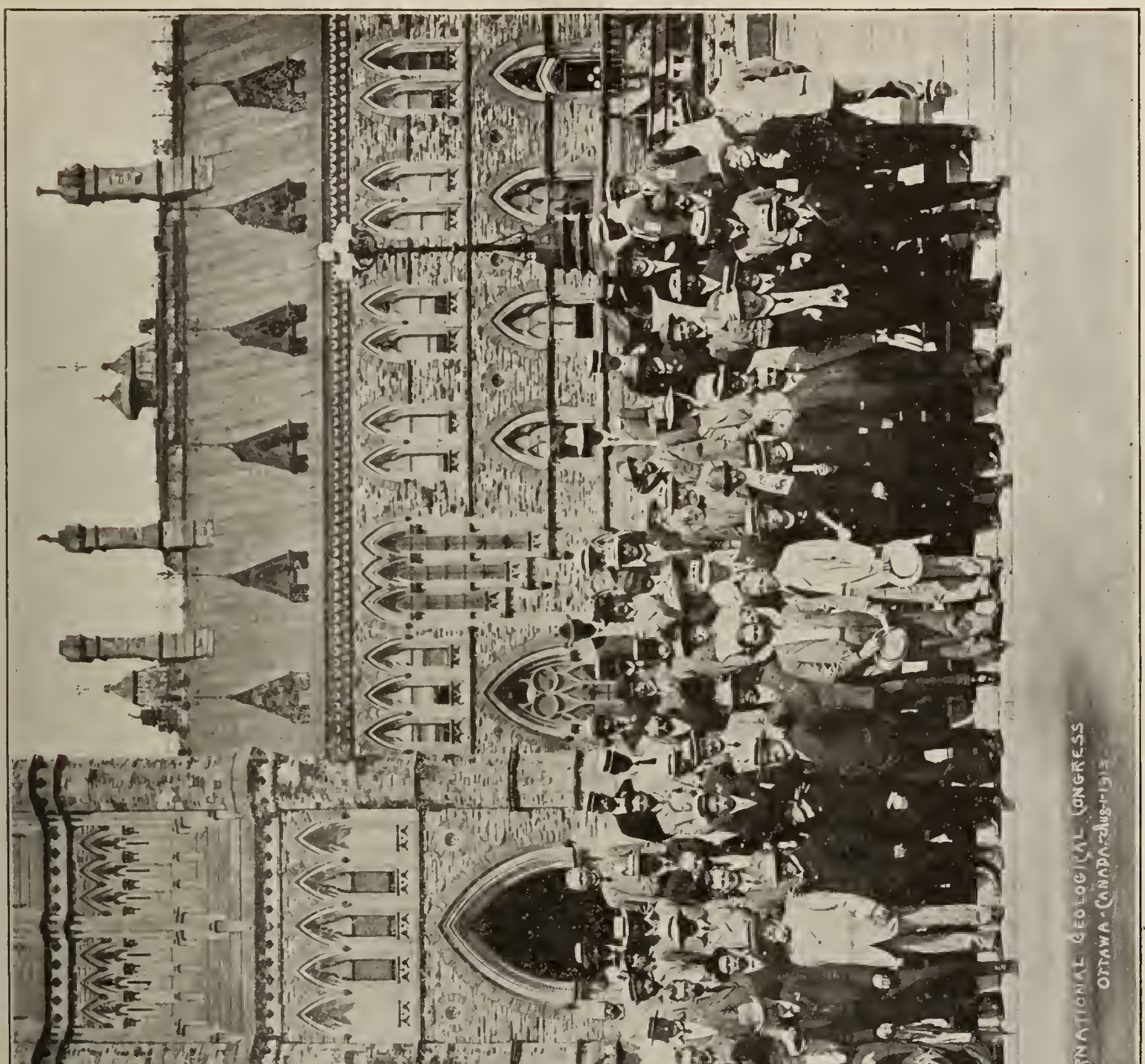
After a few words of welcome from Controller Parent on behalf of the city, Dr. Frank D. Adams, dean of the Faculty of Applied Science at McGill University and president of the International Geological Congress, replied on behalf of the latter body. He referred to the magnificent scale on which Nature's geological formations were visible in the Dominion. Its climate, too, was varied, and he had found great difficulty in convincing many of the delegates that "Our Lady of the Snows" could ever boast of even an inch of such frosty covering. In announcing the future programme of the party he made the interesting statement that on visiting Caughnawaga several of the delegates would be made chiefs of the Iroquois tribe.

Other brief addresses were delivered by Dr. A. Strahan, director of the British Geological Survey; Dr. P. M. Termier, of Paris, director of the French Geological Survey; Dr. Max Belowsky, of Berlin, president of the university there; Prof. J. F. Kemp, of Columbia University, New York; Dr. J. H. Sederholm, director of the Geological Survey of Finland. Hon. Mr. Perley, who acted as chairman, also spoke a few words.

### Tablet Unveiled.

At the conclusion of the luncheon the visitors were shown over the Farm and were then taken to the Victoria Museum for the unveiling of the tablet to the founder of Canada's Geological Survey and first director. The tablet has been affixed to a huge specimen of the Laurentian formation, the one with which Sir William Logan's work was chiefly connected. It was procured in Rockcliffe and has been set on a concrete pedestal in front of the main entrance of the Museum. On the tablet of copper is the following inscription: "Sir William Logan, Kt., LL.D., F.R.S., 1798-1875, the father of Canadian geology, founder and first director Geological Survey of Canada, 1842-1869; erected by the International Geological Congress of Canada, 1913."

The tablet was unveiled by Hon. T. W. Crothers, Minister of Labor, in the absence of Hon. Louis Coderre, Minister of Mines. After a few remarks by Mr. James White, of the Conservation Commission, Hon. Mr. Crothers accepted the tablet on behalf of the Government of Canada. He referred to the importance of the pioneer work which had been done by the late Sir William Logan in the interests of the Dominion and congratulated the Congress on its commemoration of his memory.




**Some of the members of the A 1, A 2, and A 3 excursions visiting the Dominion Parliament Buildings at Ottawa.**

Dr. A. E. Barlow, chairman of the Logan Memorial Committee, also said a few words, stating that besides the present tablet one had already been erected in Perce, in Gaspe Peninsula, where much of Dr. Logan's early work was carried on. President Adams, of the Congress, then gave a sketch of Sir William Logan's career. A Montreal man, he had gained experience in Wales and then returned to Canada as first director of the Canadian Geological Survey. He had been given the munificent sum of fifteen hundred pounds and told to go out and survey Canada with it, a work to which he devoted not only all his energy, but considerable private resources.

At the conclusion of the ceremony the delegates were entertained to tea in the Museum, and then left for Montreal.

### Reception in Montreal on August 2.

The scientific and intellectual world of Montreal on August 2 entertained nearly three hundred geologists, who have gathered from every civilized country in the globe to meet in Toronto next week in international conference. To these men belong the functions of digging out and reading in rocks and stones the early history of the earth, and to make guesses at the riddle of existence. It was not a band of "fossils," but of keen analytical professors, that were entertained by a committee, presided over by Dr. Milton Hersey and representatives of the Universities of McGill and Laval. Many persons marked the absence of an official reception from the civic corporation, due to an oversight in not providing funds in time; but the distinguished entertainment committee made such excellent arrangements in providing for the reception and care of their guests as to more than make up for an absence of civic recognition. It was a highly intellectual party that stayed at the McGill Union over night, sent representatives to the McGill Convocation, had luncheon at the Windsor, and went on an excursion to Lachine, visited the Indian village of Caughnawaga, witnessed the historic and traditional tribal rites, and had an exciting trip down the Rapids, where the boat was somewhat damaged and had to be hurriedly docked.

The day's round of duties began with the Convocation of McGill University at Royal Victoria College. Here a very distinguished audience witnessed the oldest Canadian university confer her highest, her most prized degree of Doctor of Philosophy, honoris causa, on six distinguished visitors. The recipients all expressed their deep sensibility at receiving this mark of signal appreciation, and at being enrolled among the McGill alumnae. The proceedings were plain and direct.

Shortly after 10.30 o'clock, the time set for the convocation to meet, a procession, headed by Dean Moyse, the acting principal, and made up of members of the faculty and the six recipients of the Degree, made its way to the Hall of Convocation.

Those who were honored by Degrees were: Prof. Helge Backstrom, of Mineralogy and Petrography, in the University of Stockholm; Prof. Alfred Bergeat, of Geology of the University of Koenigsberg, Germany; Prof. James Furman Kemp, of Geology, of Columbia University, New York; Lecturer Alfred Harker, of Petrology, in Cambridge University, and Prof. Alfred Lacroix, of the Museum of Natural History, Paris.

Each candidate for the degree was introduced by a member of the McGill faculty; Dean Moyse said over a few words of Latin, and he became a Doctor of Philosophy.

After the procession reached the platform, Prof. John Macnaughton opened the proceedings wth prayer. Then came the work of conferring Degrees.

Prof. Howard Barnes, introducing Prof. Helge Backstrom, of Stockholm University, the first to be honored, said that Swedish savant was a representative of the distinguished school of geologists, whose studies of ancient geological formations of the far north of Scandinavia have shed so much light on the early history of the world. He is an author of scientific repute, and a member of the Upper Chamber of the Swedish Parliament.

Dr. Backstrom, in reply, expressed his deep gratitude at the honor conferred upon him by the Canadian geologists, whose studies were similar to their own. He took this as a testimonial that the work of the Swedish geologists was appreciated in this country. Sweden had water powers and a similar climate to this country, and he expected that from these aspects the civilization of the two countries would develop on similar lines. In conclusion, he expressed a hope that this would lead to greater intercourse in future.

Professor Dale, who was sponsor for Prof. Alfred Bergeat, of the University of Koenigsberg, the next recipient, sketched the career of the distinguished scientist. He had particularly studied geological formations in connection with ore, the developments of which had such a far reaching influence on the progress of the world. He had done distinguished work in Mexico, and his book had a far reaching effect.

In reply to the honour conferred, Prof. Bergeat spoke in German, thanking them for their interest in and honouring of his work. He spoke of the great physical aspects of Canada, and said it was important in the geological world. He modestly disclaimed any special distinction in his labours, and said the standing of McGill as a university was recognized in Europe.

Prof. Alfred Harker, lecturer on petrology in Cambridge University, was presented by Prof. Macnaughton. Prof. Harker, he said, represented the most distinguished learned societies in the English-speaking world. First came the Royal Society, founded to follow out the scientific studies opened out by Bacon. He referred to the great work of Prof. Harker in studying the rocks of Scotland. His work in the Highlands has added much to the problem of metamorphism, and he has written eminent works on his studies.

In replying to the honour, Prof. Harker said he took this distinction, not as paid personally to him, but as a tribute to his university. He would be a blind and indifferent man if he did not take a deep interest in the progress of this country, particularly education. He had deep interest in McGill University. Everywhere they went they found strong evidence of vitality and evidence of the prominent part this university is playing in the life and development of this country.

Prof. McLeod said in presenting Prof. James Furman Kemp, who occupies the chair of geology at Columbia University, as the most distinguished geologist in America. His studies of the rocks of the Adirondacks was well known. His work on the studies of ore deposits was the best compendium they possessed. For twenty years he had been a professor in Columbia University, New York, and his lectures attracted not only large bodies of students from the United States, but also from foreign countries. Prof. McLeod said he also wished to express the thanks of McGill for the brilliant courses of lectures he has delivered to her students.

Prof. Kemp said in reply that he certainly felt very much at home in a McGill audience, and in a McGill alumni. He spoke of the great part geology has played in progress, and he referred to the great work that McGill has done in this sphere. He recalled the labours of Sir William Dawson and Sir William Logan in the rocks of Ontario and Nova Scotia, of Prof. Harrington, of Dr. George Dawson, the intrepid explorer of Northern America, of the regiment of McGill graduates who have explored the north. Geologists turn to McGill from all over the world when they want knowledge of the interior of the earth, and seek it from Prof. Frank O. Adams. One member of the geological conference will carry back to his home deeply felt recollections of the significance of this day.

Dean Adams introduced Prof. Alfred Lacroix, member of the French Institute for the degree. He did much work in Guiana, Madagascar, Martinique after the volcanic eruption, where he was sent in a French battleship. His writings were numerous, and he was the most distinguished mineralogist of the present day.

In replying, Prof. Lacroix said he was deeply touched by the honour. He paid tribute to Canada as a fine country. He had been a student for twenty-five years. He spoke of the influence of McGill as high in promoting scientific research, and of the importance of the study of minerals in solving scientific problems, and the furthering of human progress.

Dean Adams said they were glad to have in Canada such a distinguished body of scientists from all the Seven Seas. He hoped they might go away well pleased with the Dominion, and he hoped that they would come back again to Canada for another geological conference. He also hoped that they would meet again before that date.

Dean Moyse, in the name of Principal Peterson, gave them a hearty welcome to McGill University. It is a young university, said he. It was founded in 1821 and in 1829 it began its work. It nearly perished, but the medical faculty, the doctors, kept it alive. Then came Sir William Dawson, a Scotchman. McGill is a Scotch university, many of its professors are Scotch, but the English professors do much to hold their own. So far as geology is concerned, McGill is the Mecca of geologists, and he cannot see why they should meet in Toronto. Canada was a country of boundless resources, and her universities were busy in turning out men to grapple with them. But they must not forget they have an arts faculty and turned out a Rhodes scholar, who won the blue ribbon of Oxford scholarship. He regretted that they had not received a civic welcome, and he hoped that when they came again they would receive one that would make up for the absence of one this time.

From the Convocation Hall adjournment was made to the Windsor Hotel, where the visitors were the guests of the Montreal reception committee to a luncheon. An orchestra played the national airs of the countries represented by the geologists.

Dr. Milton Hersey, in behalf of McGill, and Laval Universities, the local committee, and the various learned societies, conveyed their greetings to the party. Various so-called international conferences had been held in Canada at various times, but this was the first one held here worthy of the title, international.

Geologists, said Dr. Hersey, are the only persons who can go back to the earliest stages of the earth's history. This was a new country, only three hundred years old, but within a stone's throw of this hotel were rocks of the oldest geological formation.

Dean Adams, of the McGill Faculty of Applied Science, and president of the conference, thanked Dr. Hersey for the splendid reception. He then read off a list of no less than twelve excursions from Montreal, got up for the visitors. The majority go to Toronto and Niagara Falls, and leave at various times.

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# IMPROVEMENTS AT THE CONSOLIDATED COMPANY'S SMELTING WORKS AT TRAIL, B.C.

By E. Jacobs.

The Consolidated Mining and Smelting Company of Canada, Limited, continues to make improvements and additions to the plant at its lead and copper smelting works at Trail, British Columbia. That it is smelting a larger quantity of ore this year than last is evident from the following comparison, which also shows a generally higher value of ore smelted. During five months ended May 31 of this year the quantity of ore and concentrates smelted was 134,660 tons, the gross value of the metal contents of which was $3,526,436. This compares with 296,458 tons of ore smelted during the company's last fiscal year and a gross value of metal contents of $5,083,078. The monthly average smelted this year was 26,932 tons, gross value $705,287, as against that for the last fiscal year of 24,705 tons a month of a gross value of $423,590.

The chief changes and betterments made during recent months are as below:

### Lead-Smelting Department.

In the lead sampling mill provision has been made for finer crushing, so as to obtain a better product for good roasting. The crushing had been done by a Gates gyratory crusher, one set of Traylor Engineering Co.'s heavy duty rolls 42 in. diameter and 16 in. face, and two sets of lighter rolls by the same manufacturers. Now the light rolls have been replaced by two more sets of the heavy ones.

Conveyor belts are being placed under all lead beds. These will feed direct to the hoppers of the roasters, and so do away with the use of the annual labour that has been necessary for tramming from lead beds to roaster hoppers.

Part of the old Huntington-Heberlein plant building has been taken down, leaving but 175 feet of the old building standing. In place of that removed a wooden building has been erected, dimensions 61x234 ft. The roof trusses are wood with iron tie-rods, making an excellent roof that stands wind and rain and carries the snow of winter. A similar roof at the company's lead refinery building has been serviceable and lasting. An electrically operated Niles 20-ton crane is used in this building; the rails that carry the crane are spaced 58 ft. centres.

Seven Huntington-Heberlein roasters are in use, and preparations are well forward for putting in two Wedge roasters, early receipt of which is expected. Space has been provided for the latter by hydraulicking away a gravel bank, and the firebrick to be used in construction is on the ground. It is intended to have the Wedge roasters in operation late in the ensuing autumn.

There has been a rearrangement of the converter pots, of which there are thirty-six in the building. These have been placed in four rows of nine each, and in convenient proximity there has been erected a large concrete bin in which the roasted ore is collected, being taken to it from the roasters on a steel conveyor. The converter pots are placed below the bin and filled from it and are then lifted to the converter stands by the Niles crane. After its contents have been sintered and cooled, the crane takes the converter pot and drops the sinter hard down on a floor, thus breaking up the large cakes. A Hayward clam-shell bucket, the largest size made, lifts the sinter and dumps it in a hopper that feeds a 24x36 inch Farrel crusher, from which it is taken to bins by a steel conveyor. At the upper end of the conveyor the sinter is passed over coarse and fine grizzlies which eliminate the fines and leave a better product for smelting in the lead blast furnaces. The fines are mixed with fresh roast from the roasters and reconverted.

A gas producer is being installed to provide gas fuel for all the roasters and such other purposes as it shall be found advantageous to use the producer gas for.

A new building has been erected alongside the H. & H. building, for housing the small Roots blower used for the converter pots, and for a centrifugal fan giving 16 oz. pressure. In the upper story of this building are an office for the shift boss, and change and lunch rooms for the men, so that they may be away from the lead dust when eating or resting.

Three new lead blast furnaces are being constructed. Dimensions at tuyeres are 45 by 216 in. They have wrought-iron jackets, with 14 tuyeres; also cast iron jackets with single tuyeres, as at present in use on the old furnaces. Height from centre of tuyere to feed floor level is 17 feet 6 in. These new furnaces will have their feed floor on the same level as that of the copper furnaces instead of the higher level found convenient for hand feeding. With mechanical feeding arrangements, one level for the feed floor of all furnaces, both copper and lead, admits of more economical handling of furnace charges, etc. To provide room for the new furnaces, the main furnace building has been extended eastward by the addition of another bay of about 40 feet, with a lean-to on the south. The lowering of the tapping floor of the lead furnaces by 10 feet below its former level involved the removal of gravel to that depth as a minimum, and this was done by hydraulicking it out to the dump. Meanwhile the feed tracks of the two old furnaces (which are to be taken out), columns of building, etc., had to be held up while the changes were being made and until concrete piers and I-beams had been put in to form a new foundation and substructure.

**Copper Smelting Department.**

In the copper smelting department, the improvements in hand include putting in a conveyor to convey the ore from the copper sampling mill to a stock pile when there is more ore coming from the mill than can at the time be held in the furnace charge bins. A new storage bin has been built, with a tunnel under it. This bin has floor and sloping sides, so that the ore may run into the discharge chutes.

All stock pile floors and bins now have tunnels under them, so that cars for removal of materials may be run in and so be loaded with less labour, the work of shovelling being thus entirely done away with.

In place of the 4-ton motors formerly used there are now two 7-ton electric locomotives for hauling to the charge bins, while larger cars are being made, the intention being that these improvements shall allow of each day's hauling to the charge bins being done in one shift. One of the 7-ton locomotives is also used for hauling cars of lead anodes from the furnace tapping floor to the refinery, instead of by railway locomotive as before.

The copper smelting plant has for some time included five blast furnaces. Of these, No. 2 has been taken out and in its place there has been constructed a 42-in. by 35 ft. furnace with 28 standard tuyeres on each side. This furnace has an arched top and flat flue, the latter arrangement admitting of goosenecks being done away with to allow of putting in a travelling crane overhead for handling purposes on both furnace floors. It is expected that the new furnace will be found to possess such advantages that two similar furnaces, also of 450 tons capacity, will be substituted for three smaller furnaces, thus providing for treatment of 1350 tons of copper ore a day (exclusive of fluxes) in three blast-furnaces.

On the new No. 2 furnace, the water-feed pipes have been so arranged that all valves can be reached from the tapping floor, and discharge pipes so placed that the furnace-man can at all times see what waste water is coming from the jackets. The overflow trough has been made larger and placed farther out, so that no water will spill on to the furnace man when engaged underneath punching the tuyeres. This furnace has centre feed, the charge train being pushed into it by the electric motor, the charge cars running on water-cooled rails on track level. After the tunnels under the charge bins shall have been enlarged, wheels will be placed on the upper part of the charge cars and these will then, while in the furnace, run on rails placed at the proper height.

Crushing and granulating copper matte is not now done here as formerly, so the old plant used for that purpose has been taken out, thus giving more room at the west end of the furnace floor and allowing of a rearrangement of the tracks about No. 1 furnace. All low-grade copper matte is put through this furnace with siliceous ore to raise the copper content and give a matte of 35 to 40 per cent. copper for shipment to works at Tacoma, Washington, for converting.

No copper ore roasting is now done at Trail in the Huntington-Heberlein pots. Copper concentrate only, chiefly from Rossland mines, is sintered on the Dwight-Lloyd machines, the grates of which have been changed from the herring-bone grate previously used to straight slot self-cleaning grates.

**In the Blower Room.**

Blast is delivered to the furnaces at 32 to 34 oz. pressure. Six blowers have been in use—four Roots and two Connersville. Another No. 11 Roots is being added, this to give 401. cubic feet per revolution, and be driven by two 300 h.p. induction motors.

### General Notes.

The pyrite smelting of raw copper matte, commenced in the early part of 1912, has been discontinued at Trail. While this practice was followed the charge consisted of 4,200 lbs. of matte, 2,000 lbs. of siliceous ore, 13.5 per cent. of lime rock, and 4 per cent. of Crow's Nest coke.

The ore treated in the copper smelting department is obtained chiefly from the company's mines at Rossland. An approximate analysis of this ore is:

| Fe. | $SiO_2$ | CaO | $Al_2O_3$ | S | MgO |
|---|---|---|---|---|---|
| 17.0 | 44.0 | 5.5 | 15.5 | 8.0 | 3.5 |

This ore is smelted with 30 per cent. of lime rock and 16 per cent. of Crow's Nest coke.

# NOTES ON ASBESTOS VEINS AND THE MINERAL NEPHRITE

By W. J. Woolsey.*

During a recent study of thin sections made from the serpentines of the Thetford-Danville areas, my attention was attracted by a mineral with characteristics foreign to the recognized components of our asbestos bearing serpentines. In the investigation I had the good fortune to discuss the matter with Dr. Ernst Kalkowsky, director of the Royal Geological Museum at Dresden, who at once recognized the mineral as nephrite; a mineral upon which the doctor is a leading authority, having made an exhaustive study of the deposits in Italy and New Zealand, results of which are included in a †monograph published in 1906.

My purpose in the investigation of these serpentines was to discover, if possible, any new characteristics, and if by chance I might find a thin section which would throw further light on the origin of asbestos veins as discussed in my paper to the ‡C. M. I. in 1910, in which appears a §microphotograph showing an asbestos vein growing from a centre outward in both directions. In Plate M. of this article I append a photo of a thin section from Danville serpentine showing outward growth, I found quite a number of similar examples, but nowhere have I observed any intimation of an asbestos vein crystallizing from the sides inward. This theory of outward growth is now firmly advanced by the German school, and they further hold the opinion that the growth of the fissure is synchronous with the growth of the asbestos vein and caused by its crystallizing force.

Having accepted the theory of outward growth of these veins there still remains the difficult task of harmonizinz it with what is observed in the field. The multitude of asbestos veins found in every deposit show apparently unmistakable evidence of an inward growth of the fibres. In Plate N will be observed an excellent example of one nephrite in the process of crystallizing and if we dare to assume that the presence of this nephrite in the asbestos veins would determine the crystal manner, we would then understand how inward growth is also possible. This would mean that our asbestos veins are to a considerable degree composed of nephrite which, of course, would not be evident by chemical analysis.

**N—Microphotograph of Nephrite vein, magnified 30 times, showing inward growth**

**M—Microphotograph of Asbestos vein, magnified 60 times, showing outward growth**

Since learning of nephrite I have observed it quite plentifully in the Danville deposit, and in the Broughton series, where what was formerly an asbestos vein has been changed to nephrite. In the sections I examined of Thetford serpentine there was no evidence of the mineral, nor have I observed it there in place. In the monograph above referred to, it is held that all or practically all nephrite is derived from serpentine. The Broughton series being older than the Thetford series, and also older than the Danville series, in action of the formation at least, it might be expected to find it more plentiful in this older series.

*Mining Engineer, Thetford Mines. †Geologie des Nephrites im Sudlichen Ligurien.
‡Journal of the Canadian Mining Institute, Vol. xiii.
§Microphotograph faces pp. 415.

# THE COAL RESOURCES OF THE WORLD*

This monograph, which is intended to form a companion work to the Iron Ore Resources of the World, published under the auspices of the Eleventh Congress, consists of three quarto volumes of 1,360 pages in all, illustrated by upwards of 175 maps and figures in the text, and accompanied by a 68 page atlas of geologically coloured maps.

The preparation and publication of a Monograph was entrusted by the Executive Committee to a Coal Resource Committee, consisting of G. G. S. Lindsey, convenor; F. D. Adams, R. W. Brock, D. B. Dowling, Charles Fergie, James McEvoy, J. B. Porter, and William McInnes.

The work is edited by Messrs. William McInnes, D. B. Dowling and W. W. Leach, of the Geological Survey.

In the main body of the monograph there are reports on 64 countries, varying in length from over 100 pages for some of the countries with important reserves of coal, to a few pages in the cases of those with less important reserves. The greater number of the reports are in English; ten are in French and six in German. In the Summary of the Reports, which appears in the first volume, all the reports are summarized by editors, in English.

Mr. Brock, the general secretary of the Congress, contributes the preface to the book, in which is explained the conditions under which the publication was undertaken. Attention is called to the very cordial support given by Geological Surveys and other similar departments of Governments throughout the world. Through official sources such as these, the greater part of the information has been gained, although certain very valuable contributions are from the pens of specialists unconnected officially with the fields about which they write, but who were considered to have had unequalled opportunities for the study of these fields. An instance of a contributor of this character is Dr. Noah Drake, who writes on the Coal Resources of China, and whose long university experience in China has given him opportunities which few have had for the study of China's mineral resources.

Owing to the lack of uniformity in the usage of the different countries of the world in regard to the commercial classification of coals into anthracite, bituminous coal and lignite, it was found necessary to adopt an arbitrary classification, which might be used by all and thus make the results more easily comparable. A committee to whom the subject was referred drew up a scheme of classification, dividing the coals into A, B, C, and D groups, with various subdivisions, based mainly on composition and heating value. In this scheme A roughly corresponds to anthracite, B and C to bituminous coal, and D to sub-bituminous coal, brown-coal and lignite. With few exceptions the reports submitted conform to the classification asked for, as they do also to the other requirements regarding the depths to which computations were to be carried and the division of the reserves into actual, probable and possible reserve, though in some cases the information at hand has not been full enough to warrant strict compliance with the specified form on all these points.

In the Introduction Mr. Dowling summarizes the results, dealing first with the distribution of coal in the various geological systems. The range of important fields in the Palaeozoic extends from Lower Carboniferous, in the case of the fields of Central Russia, Scotland and the Arctic Island, through Upper Carboniferous, to which the very large deposits of Western Europe and Eastern America appertain, to Permo-Carboniferous, in which are embraced most of the very extensive fields of China, India and Australia. The Mesozoic, though not so widely spread, contains very important coal basins in Europe, Western America and Asia. The Tertiary contains deposits of importance in most parts of the world, including fields in Central and Western Europe, in Japan, in New Zealand and throughout the great plains region of North America.

The total reserves of the world, compiled from all the reports received, amount to 7,397,533 million tons, of which nearly 4,000,000 millions are bituminous coals, nearly 3,000,000 millions are brown-coals of various grade, and nearly 500,000 millions are anthracite coals. Of the anthracite coals, Asia, with the great Chinese fields, has by far the largest supply of any of the great continental divisions, furnishing 407,637 million tons; in bituminous coals, America, with 271,080 million tons, leads by a great margin, as she does also in the various grades of brown-coals. The world's production of coal for the year 1910 was about 1,145 million tons, so that, though much must be allowed for loss in mining and for areas that for various reasons cannot be economically mined, there still remains many hundreds of years before exhaustion of the supply may be looked for. Taking up the individual countries, however, it is found that in more than one case the end is in sight.

In other tables the reserves of the different continental areas are classified as actual, probable and possible reserve, and in others the reserve of the individual countries are classified in a more particular way, thus Canada is shown to have actual reserves, in million tons:

Nova Scotia, Class B, 2,138; Class C, 50. Alberta, Class A, 668; Class B, 3,209; Class D, 384,908. British Columbia, Class A, 7; Class B, 23,764; Class D, 60; or totals of, A, 675; B and C, 29,161; D, 384,968 million tons; and to have probable reserves in addition of: A, 1,483; B and C, 254,500; D, 563,482 million tons.

The production of Canada at the present time is only in the neighborhood of twelve million tons annually, and though the output may be expected to increase rapidly the figures given above show that actual exhaustion of the supply lies very far in the future.

Following the Introduction is a Summary of the Reports by the Editors. In this a resumé, in English, of each of the extended reports in the volumes is given, together with brief compiled statements regarding a number of countries, including among others Greenland, from which comprehensive reports were not received. Lists are given also of the countries from which statements were received that they have no known coal resources.

The main part of the volumes, comprising 1,266 pages, is taken up by the extended reports received from the different countries of the world which have coal resources in one form or another. A glance over the index is sufficient to show how rare it is in any quarter of the globe, to find a country without fossil fuel of some kind. Volume I. contains reports from the Islands of Oceania, including besides the Australasian Island, the Philippines, Netherlands, India and the Antarctic continent, which is dealt with

*The Coal Resources of the World, an enquiry made upon the initiative of the Executive Committee of the Twelfth International Geological Congress, Canada, 1913. Three quarto volumes and an atlas in colours, 13½ x 19½ inches, bound in heavy paper covers. Morang & Co., Limited, Toronto, Canada.

by the well-known authority, Dr. David; and Asia. Under Asia is a very full report by Dr. Noah Drake on China, supplemented by one covering portions of China in detail and illustrated by 16 figures of different coal fields, by Kinosuke Inouye, of the Imperial Japanese Survey; the reports on China are very valuable contributions to our knowledge of the coal reserves of the world, since each of them contains much information not hitherto published, in the case of the Japanese report containing information acquired by various officers of the Japanese Geological Survey corps; articles by Inouye on Corea, Manchuria and Japan, all illustrated by figures and containing much new information; a very well written paper by H. H. Hayden, director of the Indian Geological Survey, on British India and neighbouring countries, and reports on the Malay States, Siam, Persia, and French Indo-China.

Volume II. contains reports concerning Africa, North, South and Central America, the West Indies, and part of Europe. Under Africa there is a report on the States of the South Africa Union, furnished by the Department of Mines, which contains good descriptions of their coal-bearing Karroo system, which lies upon a glacial conglomerate; and from eight other divisions, including Southern Nigeria, Rhodesia and Belgian Congo. North America begins with a report by J. P. Howley on the coal areas of Newfoundland, which, although they have not yet been exploited, Dr. Howley thinks are worthy of development and constitute extensions of the Nova Scotia fields. The article on Canada, which follows, is furnished by D. B. Dowling, who deals with the coal fields in order from east to west, describing each in turn, and tabulating its actual and probable reserves. Mr. Dowling estimates a total reserve in Canada of all classes of coal of 1,234,269,210,000 metric tons. The fields in the United States are taken up by M. R. Campbell, of the United States Geological Survey. Mr. Campbell estimates that the original content of the United States coal fields, not including Alaska, was 3,225,394,300,000 metric tons, of which up to 1910, 11,220,532,560 tons had been exhausted. Alaska is given separate treatment by A. H. Brooks and G. C. Martin, who consider that the known fields contain nearly 20,000 million tons over half of which is lignite. Robert T. Hill, late of the U. S. Geological Survey, contributes the paper on Mexico.

For Central America, the West Indies and South America, there are reports from Honduras, Panama, Trinidad, Colombia, Argentine and Chile. The chilean fields, which seem to be all of Tertiary age, are described by Miguel R. Machado, and the Argentine fields by E. Hermite, the director of the Argentine Geological Survey.

The rest of Volume II. is taken up with a part of the European reports. Great Britain is treated of by Dr. Strahan, of the British Survey, and Ireland by Grenville A. J. Cole and E. St. John Lyburn. The greater part of the coal is bituminous, and the total possible reserve for the Kingdom is estimated to be 189,534,-749,920 metric tons. The report for Portugal is from the Department of Agriculture, and that for Spain by Luis de Adaro.

France is written off by M. Defline, one of the most eminent of the French corps of Mining Engineers, who estimates for France a reserve of coal of 17,584,625,000 tons, a large part of which is of bituminous grade. The French report is very fully illustrated by a series of geologically coloured maps in the atlas, showing all the principal coal fields of France in detail.

Other papers of exceptional interest in the second volume are those of Switzerland and Turkey; the former for the reason that it presents the case of a country whose resources in coal are almost depleted, the total actual reserve of Switzerland amounting to only 4,000 tons of anthracite and 500 tons of bituminous coal. Turkey, on the other hand, which is dealt with by Leon Dominian, M.E., has very considerable amounts of brown-coal in her Asiatic provinces and deposits of camel-like bituminous coal in the province of Adrianople. Reports from Italy, Greece and Bulgaria complete Volume II.

The 368 pages of Volume III. contain the reports from the remaining fourteen countries of Europe. All these reports are of a most interesting character, and all are the work of most eminent specialists in the various countries to which they refer; Denmark's contribution is by Dr. N. Hartz, that of the Netherlands by W. A. J. M. van Waterschoot van der Gracht, and that of Belgium by Armand Renier, M.E.

Germany contributes a most exhaustive description of the different coal fields of the Empire, written by twelve distinguished geologists, each describing a district with which he is particularly familiar. Very full tables of reserve accompany the German report; summarized, they give for Germany a total actual reserve of 94,865,000,000 tons of Stein coal and 9,314,300,000 tons of brown-coal, with in addition a large probable reserve.

The interesting report on Hungary is by Dr. Ludwig von Loczy and Dr. Charles de Papp, and that for Austria by Dr. Petrascheck, the eminent director of the Austrian Geological Survey; each of these reports is illustrated by maps, that of Austria being accompanied by a very valuable set of coloured maps in the atlas, which have been especially prepared for the work by Dr. Petrascheck. Bosnia and Herzegovina, Servia and Roumania are represented by papers contributed, in each case, by men who are in a position to speak with authority for each country.

Sweden, which has considerable resources in bituminous coal, is described by Dr. Edvard Erdmann. Norway's possible coal reserves, which are confined to some of the northern islands, are dealt with by Dr. Hans Reusch, and the interesting fields of Spitzbergen are the subject of an additional special paper by Bertil Hogbom, who estimates for that island a probable reserve of bituminous coal of 8,750,000,000 tons.

The volume closes with a paper, in English, on the coal fields of Russia, including Russia in Asia. Dr. Th. Eschernyschew, the director of the Russian Geological Survey, who in an introduction summarizes the Russian report, estimates for the Empire a probable reserve of coal of all grades of 239,997,000,000 tons, of which 18,001,000,000 tons are of anthracite coals.

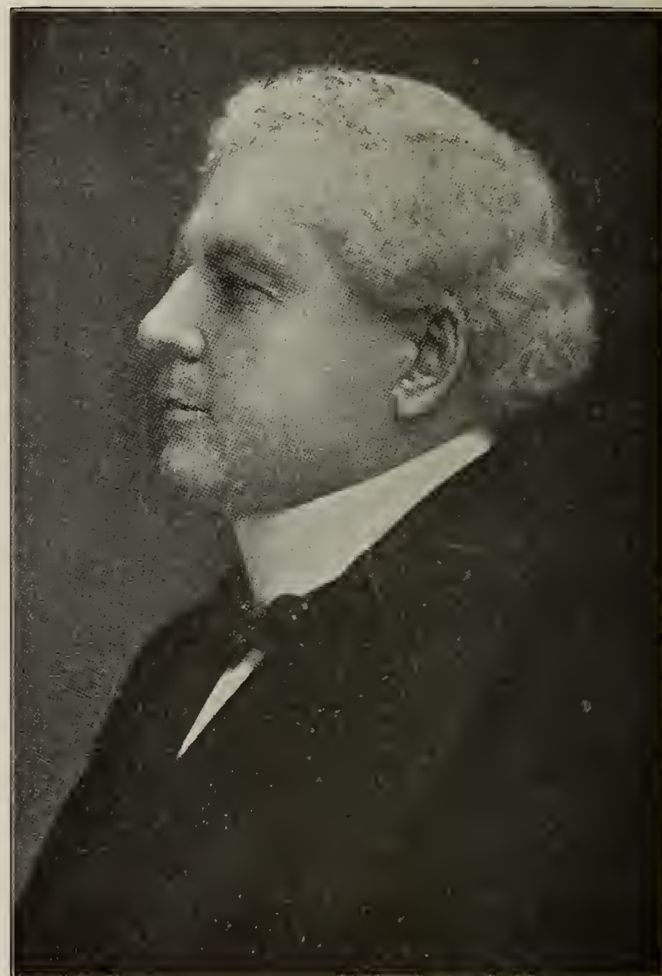
For the purposes of the report, the Russian dominions are divided into thirteen districts, which are described separately, each by an author who has had especial opportunities of studying the particular field he describes. The collation of the information for this report, and the same is true of many reports contained in the volumes, entailed a large amount of field work, undertaken for the special purpose of the investigation, so that the 120 pages devoted to Russia are all of intense interest.

The reports contained in the volumes are illustrated by upwards of 175 maps and figures and by many tabulated statements.

The Atlas, which presents a very bright and attractive appearance, contains 68 pages of maps, most of them in colours. It opens with a map of the world in hemispheres, geologically coloured to show the distribution of Tertiary, Mesozoic and Palæozoic coals throughout the world. Especially noteworthy among the plates are, perhaps, the colonred maps of China, Corea, Manchuria and Japan, those of Austria and of France; the eight maps of the coal fields of Canada and those of Servia, Ronmania and Sweden. The Atlas closes with a geologically coloured map of the island of Spitzbergen.

# ANNUAL REPORT OF THE MINISTER OF MINES FOR BRITISH COLUMBIA FOR 1912

The Annual Report of the Minister of Mines for British Columbia for the year 1912 was issued last month. It fills about 35 more pages than that for 1911, and, generally, is a comprehensive aceount of the progress of the mining industry of the provinee. It shows the mineral production for the year under review to have been of a total value of $32,440,800, as compared with $23,499,072 for 1911 and $26,377,066 for 1910. The comparison with the last mentioned year is the fairer one, for the 1911 produetion was adversely affected by labour difficulties at Crow's Nest Pass coal mines and consequent lessening of output of minerals, while during 1910 conditions were normal.



SIR RICHARD McBRIDE, K.C.M.G.

Premier and Minister of Mines of British Columbia

### Quantities and Value of Production.

The quantities and value of the several products are shown in the following table:

| | |
|---|---|
| Gold, placer | $ 555.500 |
| Gold, lode, 257,496 oz. | 5,322.442 |
| Total gold | $ 5,877.942 |
| Silver, 3,132,108 oz. | 1,810,045 |
| Lead, 44,871,454 lb. | 1,805,627 |
| Copper, 51,456,537 lb. | 8,408,513 |
| Zinc, 5,358,280 lb. | 316,139 |
| Total metallic | $18,218,266 |
| Coal, 2,628,804 tons of 2,240 lb. | 9,200,814 |
| Coke, 264,333 tons of 2,240 lb. | 1,585,998 |
| Miscellaneous (building materials, etc.) | 3,435,722 |
| Total value of mineral production | $32,440,800 |

Summary—

| | | Value. |
|---|---|---|
| Metalliferous minerals | | $18,218,266 |
| Non-metalliferous minerals— | | |
| Coal and coke | $10,786,812 | |
| Building materials, etc. | 3,435,722 | 14,222,534 |
| Total | | $32,440,800 |

In January the Department published a "Preliminary Review and Estimate of Mineral Production" for 1912, in which the estimate of the Provincial Mineralogist, Mr. Wm. Fleet Robertson, was that the total value of the mineral products was $32,606,000. The revised figures show that this estimate was $165,200 in excess of the actual value of the produetion—a quite small amount in comparison with the total, and an evidence of the care taken in endeavoring to ascertain the position before returns had been received from the producing mines. There was variation in totals of value of separate mineral products, the chief of which were an underestimate of that of gold by about $417,000, and an overestimate of that of building materials, etc., by about $814,000. However, the total value, as eventually ascertained, was so near to that given in the preliminary estimate, that the usefulness of having the latter prepared and made available for the information of the public, as had also been done in two immediately preeeding years, was again demonstrated.

### The Statistical Tables.

The various statistical tables included in the report under review give much information to those interested in the mineral production and progress of the mining industry of British Columbia. Table 1 shows the gross value of each of the more important of the minerals produced, and that the aggregate value for all years is $430,137,522, in the following proportions:

| | Value. |
|---|---|
| Placer gold | $ 72,194,603 |
| Lode gold | 70,859,022 |
| Total gold | $143,053,625 |
| Silver | 33,863,940 |
| Lead | 27,520,753 |
| Copper | 73,723,562 |
| Other metals (zinc, etc.) | 1,528,403 |
| Total metallic | $279,690,283 |
| Coal and coke | $132,871,155 |
| Building stone, bricks, etc. | 17,576,084 |
| Total non-metallic | $150,447,239 |
| Aggregate value of production | $430,137,522 |

Table II. shows the value of each year's total production over a period of 20 years—1893-1912. It is seen that the total for 1912 was the highest—by $6,063,734, or 23 per cent, higher than that of the previous highest—of all years in the history of mining in the province.

Table III. exhibits the quantities and value of production for three years—1910, 1911 and 1912—the figures from the last year, shown in the first above-printed table, are taken from this. There was a general increase in production, save only in building materials, as compared with 1911, while comparatively small decreases in lode gold and coal was abundantly compensated for in other minerals, to a net total, as already stated, of more than $6,000,000.

### Production by Districts.

Table IV. exhibits the output of minerals by districts and divisions for three years. Omitting divisions and taking that of districts only for the years 1910 and 1912 for comparison (1911 production not having been normal), the figures are as under:

| Districts. | Value of Production. 1910. | 1912. |
|---|---|---|
| Cariboo | $ 239,000 | $ 268,000 |
| Cassiar | 283,807 | 467,579 |
| East Kootenay | 6,121,832 | 5,723,004 |
| West Kootenay | 5,088,186 | 6,165,255 |
| Boundary | 6,998,519 | 8,716,406 |
| Lillooet | 9,832 | 5,000 |
| Coast | 7,635,890 | 11,095,556 |
| Totals | $26,377,066 | $32,440,800 |

It will be seen that the only decrease worth noting was that of East Kootenay, of nearly $400,000. The largest increase was in the Coast district, which, however, made a gain of only $516,500 as compared with 1911, in which year labour difficulties did not affect this district as they did the Kootenays and Boundary. The increase made by West Kootenay district came from Ainsworth and Slocan in largest amount ($1,160,000), and Trail Creek in smallest ($249,000), against which there was a loss of $294,000 in Nelson division and $38,000 in other parts, leaving a net gain for the district of $1,077,000. Of Boundary district's gain of nearly $1,718,000, about $1,459,000 was in the value of copper produced. More than half of the gain made in Coast district was in copper and the remainder in structural materials.

### Various Mineral Products.

Table V. gives some details of the miscellaneous products included in the year's mineral production, mostly of the various building and other structural materials, such as cement, lime, building stone, rock, sand and gravel, clay products, etc. While these figures are not complete, they are believed to fairly represent the approximate value of those products so far as it has been practicable to ascertain it.

Tables VI., VII. and VIII. are the customary record of yearly totals of placer gold, lode metals, and coal and coke, respectively. An examination of these will show that the total for placer gold was in 1912 the highest for four years; that for lode gold second only to 1910 in all years; that for silver the highest since 1906; that for lead higher than for any preceding year since 1907; while the total value of copper constitutes the highest on record in the province. In coal and coke the figures were the highest yet recorded, except for 1910, when the total for these minerals was nearly $322,000 higher.

Table IX., which is the most elaborate table in the Report, shows details of metalliferous production for four years—1909-1912—and the districts and divisions in which such production was made. Tonnage of ore mined and its metallic contents and market value are also included in this table.

Table X. presents in graphic form the facts shown in figures in other tables, and demonstrates to the eye the growth of mineral production and the fluctuations to which it has been subjected.

### Comparison With Other Provinces.

Table XI. compares graphically the output of certain mineral products of British Columbia with the combined output of similar products in all the other provinces of the Dominion. An analysis of the figures gives the result that British Columbia produces more lode gold, lead and copper than all the rest of the Dominion combined, and is to be credited with nearly 30 per cent. of the value of the coal and coke production of Canada.

### Men Employed in Mining.

A summary of the figures showing the number of men employed in several classes of mines follows:

There were 86 mines that shipped ore in 1912 (51 of them more than 100 tons each), and there were employed in these a total of 3,402 men—1,229 above and 2,173 below ground. The non-shipping mines numbered 96, of which 51 were idle and 45 working; in the latter 435 men were employed—130 above and 300 below ground. The total number employed at metalliferous mines was, therefore, 3,837.

The coal mines gave employment to a total of 7,130, this number including 221 boys among the 6,391 whites, and the following other classes of labour: Japanese 117 and Chinese 622. The proportion employed underground was 5,275, of which 4,952 were whites and only 323 were of other races.

From the foregoing it will be seen that there were employed at metalliferous mines 3,837, and at coal mines 7,130; total, 10,967. It may be taken for granted that men engaged in prospecting were not included, and probably the figures omit as well men employed at smelting works, but of this there is not any mention.

(To be continued.)

## CROWN RESERVE.

Owing to falling off in production from the Carson vein the Crown Reserve Mining Company's profits have been recently much diminished, and it is announced that the 3 per cent. monthly bonus will not be paid regularly in the future. The announcement followed a sensational drop in the market price of the stock.

# CLASSIFICATION OF COALS

By J. M. Gordon, Montreal.

Many attempts have been made to classify coals, but no classification to-day is strictly accurate. A classification very much in use by the commercial man is the classification of coal by the length of flame, but as this can only be comparative we have in different districts the same phrase meaning an entirely different degree of the physical properties exhibited by the coal when under a state of combustion. For example the long flame coals of the North of England are very different from the long flame coals of Scotland. Again flaming coals mined at Aachen (Aix le Chapelle) would, on a Westphalian basis, be classified as dry, and under the same classification the coke coals found in the Saar District would be named flaming coals. The flame depends on the quantity of hydrogen and carbon volatalized. No classification can be formed from a volatile matter basis. This will be seen when the two following Welsh coals are compared. They each have approximately 35 per cent. volatile matter:

| | Carbon | Hydrogen | Oxygen and Nitrogen |
|---|---|---|---|
| *Vivian & Sons, Morfa. | 88.27 | 5.66 | 6.07 |
| Machine rock vein .... | 75.98 | 5.15 | 18.87 |

These coals have the same volatile matter, but are far apart in composition and in calorific value.

These terms apply whether the low agglomerative power of the oxygen or volatile matter content is high or low.

This classification makes no discrimination between a high carbon non-coking coal and a low carbon high oxygen non-coking coal; they are both thrown into the same heap and called sand coals. If there is to be any classification at all, surely it should discriminate between an anthracite coal and a very poor steam coal or lignite. The classification runs as follows:

Combined hydrogen under 2% carbon:

Disposable hydrogen under 4% carbon is a dry or sinter coal, or anthracite.

Disposable hydrogen over 4% carbon, coking coals.

Combined hydrogen over 2% carbon:

Disposable hydrogen over 4% of carbon, difficulty coking gas coal.

Disposable hydrogen under 4% of carbon, non-coking gas and sand coals.

On examination of the above it will be noticed that the properties of coking are attributed in both cases to the coals containing disposable hydrogen over 4% of carbon. This classification cannot be considered accurate since cannel coals will not conform with the rule; neither will some of the Scottish steam coals. Since this classification was drawn up it has been infallably proved that oxygen as a primary base to work on will lead to no true scientific classification. Hilt on grasping this drew up a classification based on volatile matter expressed in percentage of the amount of coke. It reads as follows:

Schondorff's Classification of Coals

| Surface. | Colour. | Coherence. | Schondorff Term. | Sylers Term. |
|---|---|---|---|---|
| Rough like fine sand. | Black. | Entirely pulverulent | Sand coal. | Discretive coal. |
| Rough like fine sand. | Black. | Just coherent flat. | Sintered sand coal. | Semi-accretive. |
| Rough like fine sand. | Black. | Just coherent all over flat, radial cracks in coke. | Sinter coal. | Accretive. |
| Rough like fine sand. | Dull grey | Solid with bud-like projections from surface. | Coking Sinter coal. | Semi-Concretive. |
| Smooth. . . . . . . . . . . | Metallic grey | Solid more or less swollen. | Coking coal. | Concretive. |

In 1865, in Uber die Steinkolen Deutchlands Fleck published a classification, based on combined hydrogen, or in other words, he employed an oxygen basis. As Syler has pointed out this classification is most inaccurate, and to demonstrate this he shows that between the limits of 90 and 93 per cent. of carbon the hydrogen is given at 4 to 4.5, and volatile combustible 10 to 18 per cent., while the statement is made that this coal is lean or anthracite with a pulverulent coke. Actually between these limits are coals carrying from 3.4 to 5.2 per cent. of hydrogen, and from 6 to 24 per cent. of volatile matter. These coals vary from hard coals, which are non-coking to very pronounced coking coals.

Schondorff, who so strongly condemned Greners classification, brought out a classification based on coking properties:

Lean Anthracite coals ..... 5 —10 per 100 of coke
Sinter coals poor in gas....10 —15.5 per 100 of coke
Coking coals .............15.5—33.3 per 100 of coke
Coking gas coals ..........33.3—40 per 100 of coke
Gaseous Sinter coals ......40 —44.4 per 100 of coke
Gaseous sand coals .......44.4—48.0 per 100 of coke

Along with this classification can be taken Gruners' which runs as follows:

*Syler.

**Gruner's Classification of Coals (Exclusive of Lignites) as Regards Their Industrial Value.**

| Names of the Five Types, or Classes. | Real calorific power. | Evaporative power. K. | Percentage composition of the organic constituents. Carbon. | Hydrogen. | Oxygen. | Number of parts by weight of oxygen ,taking the weight of H as 1.* | Weight of volatile matters yielded by 100 parts of coal. | Weight of coke yielded by 100 parts or pure coal. |
|---|---|---|---|---|---|---|---|---|
| 1st Class—Dry coals, burning with a long flame ... | 8,000 to 8,500 | 6.70 to 7.50 | 75 to 80 | 4.5 to 5.5 | 15 to 19.5 | 3 to 4 | 55 to 60 | 45 to 40 |
| 2nd Class—Fat coals, burning with a long flame, or gas coals ............. | 8,500 8,800 | 7.60 8.30 | 80 85 | 5 5.8 | 10 14.2 | 2 3 | 60 68 | 40 32 |
| 3rd Class—Fat coals, properly so-called, or furnace coals................. | 8,800 9,300 | 8.40 9.20 | 84 89 | 5 5.5 | 5.5 11 | 1 2 | 68 74 | 32 26 |
| 4th Class—Fat coals, burning with a short flame, or coking coals .......... | 9,300 9,600 | 9.20 10 | 88 91 | 4.5 5.5 | 5.5 6.5 | 1 | 74 82 | 26 18 |
| 5th Class—Lean (maigre) coals, or anthracites .... | 9,200 9,500 | 9 9.50 | 90 93 | 4 4.5 | 3 5.5 | 1 | 82 90 | 18 10 |

*This amount includes the nitrogen, which Gruner states rarely exceeds 1 per cent. of the organic constituents, but this is rather under the average amount.

The nature and appearance of the coke in the 1st class was pulverulent or at the most fritted; in the 2nd class caked but porous, and very brittle; in the 3rd class caked, moderately compact, and more or less swollen; in the 4th class caked, very compact, but little friable; and in the 5th class somewhat slightly fritted but more frequently pulverulent.

Muck has already disposed of these classifications by shewing that the coals of the Ruhr district do not agree with them, since they contain 10 to 15 per cent. of volatile matter and so would be classified as non-coking coals while they are decidedly coking coals; while again in the Ruhr district coals are mined containing 30 to 32 per cent. volatile matter, which are distinctly long flame bituminous coals, but which would be classified by Gruner as Smith coals. I cannot see where there could be any correlation between coking properties and volatile matter. Generally speaking, the coals found in the Westphalian district in Germany are much poorer in volatile matter per degree of hardness of coke than in most other districts in Europe, while the contrary is to be said about the coals of the Saar district. Below 75 per cent. of carbon Gruner considers the coals no longer bituminous, but lignite. This is quite erroneous, for many of the Scottish carboniferous coals go below this percentage in carbon. Cannel coal does not agree with this classification.

**Andrae Classification of Coals.**

| | Carbon | | Hydrogen | | Oxygen and Nitrogen | | Specific Gravity | |
|---|---|---|---|---|---|---|---|---|
| Anthracite.............................. | 90 | to 95 | 4.5 | to 3 | 5.5 to | 2 | 1.4 | to 1.6 |
| Semi-bituminous .................... | 89 | 92 | 5 | 4 | 6 | 4 | 1.35 | 1.40 |
| Bituminous, clear burning ........... | 88 | 91 | 5.5 | 4.5 | 6.5 | 4.5 | 1.31 | 1.35 |
| Bituminous, flaming ............... | 84 | 89 | 5 | 5.5 | 11 | 5.5 | 1.29 | 1.31 |
| Bituminous, fuliginous .............. | 80 | 85 | 5 | 8.5 | 14.2 | 10 | 1.25 | 1.29 |
| Gaseous.............................. | 75 | 80 | 5.5 | 4.5 | 19.5 | 15.5 | 1.22 | 1.25 |

Like Gruner's classification this one also takes in limits of hydrogen concomitant with carbon. The hydrogen range, like Gruner's, is wrong, so also is the range of specific gravities. For example he allows 1.22 to 1.25 for gaseous coals; that is coals from 75 to 80 per cent. in carbon. He has not taken into consideration the weight of ash, nor will his specific gravities anywhere compare with the Scotch coals ranging about 76 per cent. in carbon lie around 1.29 to 1.31. Here also he makes his minimum of carbon 75, and thus cuts out a large percentage of the coals of Scotland.

The following classification was brought forward by C. Syler:

1. Anthracite Carbon Plane:—
   (a) Ortho-hydrous; H. under 4; Vol. under 9 (5-9) ortho anthracite.
   (b) Per-hydrous; H. over 4; Vol. over 9 (9-15) semi-anthracite.
2. Carbonaceous Plane: C. 93.3-91.2:—
   (a) Sub-hydrous; H. under 4.2 (1) Vol. 7. 7-12; sub-carbonaceous.
   (2) Vol. under 7.7 pseuda anthracite.
   (b) Ortho-hydrous; H. 4. 20-4.45 Vol. 10-14; carbonaceous.
   (c) Per-hydrous; H. over 4.5 Vol. 14.21 semi-bituminous.
3. Hydro-carbonaceous or Bituminous Plane C. 91.2-84.
   (1) Meta-bituminous: 91.2-89.
   (a) Sub-hydrous H 4.5-4.9 Vol. 16-23: Sub meta bituminous.
   H 3.7-4.5 Vol. 10-16 pseudo carbonaceous.
   H under 3.7 Vol. under 10 pseudo anthracite.

(b) Ortho hydrous H. 4.9-5.7 Vol. 23-30.
(c) Per hydrous H. over 5.7 Vol. 30.44.
(2) Ortho Bituminous C. 89-87.
(a) Sub-hydrous H. 4.5-5 Vol. 16-23: Sub-ortho bittuminous.
H under 4.5 Vol. under 16 pseudo carbonaceous.
(b) Ortho-hydrous H. 5-5.7 Vol. 23-30.
(c) Perhydrous H. 5.7 and over Vol. over 30.
(3) Para Bituminous C. 87-84.
(a) Sub-hydrous H. 5 and under Vol. 16-29 sub para bituminous.
(b) Ortho hydrous H. 5-5.8 Vol. 30-40 usually.
(c) Perhydrous H. over 5.8 Vol. over 40 seldom under.

4. Carbo-hydratous or Lignitious plane C. 84-75.
Meta Lignitious C. 84-80 Ortho Lignitious C. 80-75.
(a) Ortho-hydrous H. 4.7-5.8 Vol. 31-57.
(b) Perhydrous H. over 5.8 Vol. 31-57.

Anthracite Carbon Plane—

Arthohydrous coals are quite descretive( non-coking) the residue being powdery. Volatile matter is not proportional to hydrogen.

Perhydrous coals: The higher percentage of hydrogen gives this coal no longer the properties of anthracite, but those of a dry non-coking car bonaceous coal.

Carbonaceous Plane—

Orthohydrous coals: Coke partly firm, coherent, or hard and partly in powder. This is what Schondorff calls a sintered sand coal (semi accretive Seyler.) Includes the famous Welsh Aberdare smokeless and some Westphalian Esskohlen.

Sub-hydrous: All these coals are sand or discretive coals, include certain dry steam coals and bastard anthracites.

Perhydrous: The coke is generally well formed near the lower limits of hydrogen the coke is sometimes black, rougher flat or the coal is of the accretive class, like the normal hydrous coals of the carbonaceous plane.

Bituminous or Hydrocarbonaceous Coals: Meta bituminous plane—

Ortho hydrous: This class belongs to Gruners short flame bituminous coal or coke coal proper.

Sub-hydrous: As the hydrogen goes down the coals become almost discretive.

Ortho Bituminous or Ortho Hydrocarbonaceous plane—

These correspond to the true bituminous coals of Gruner. Most of the coking coals of Westphalia belong to this class.

Para Bituminous—

Splint and free burning steam coals; Silkstone of Yorkshire.

Carbo-hydratous—

All coals down to the true lignites.

Exceptions to the correlation of hydrogen and volatile matter are those by Muck of the Pseudo cannies that associate coals in Westphalia.

C. Syler in his classification makes his lowest plane, which he calls carbohydratous, contain from 84 to 75 per cent. of carbon. Everything below this he calls a lignite. It may be pointed out that there are few places in the Scottish carboniferous coalfields in unfaulted zones, or in zones that have not suffered from regional metamorphism, where the coals do exceed 75 per cent. of carbon. Syler has deduced nearly all his facts from South Wales—a coalfield which has suffered a good deal both from dynamic and regional metamorphism. Nor will Syler's classification apply to the Westphalian pseudo-cannels and their associates, some of the Vancouver Island coals, or the Scottish or English cannel coals.

Recently in Canada a classification, called the "Split-Volatile ratio" has been in use. The classes adopted for this method are:

| | |
|---|---|
| Anthracite | 15 |
| Semi-anthracite | 13 —15 |
| Anthracite coal | 10 —13 |
| High carbon bituminous | 6 —10 |
| Bituminous | 3.50— 6 |
| Low carbon bituminous | 3 — 3.50 |
| Lignitic coal | 2.50— 3 |
| Lignite | 1.20— 2.50 |

These figures are derived from a formula concocted as far as I can see on no legitimate hypothesis. As a matter of fact it has a few different forms. As submitted by D. B. Dowling it reads:

$$\frac{\text{Fixed Carbon} \times \frac{1}{2} \text{ Volatile Combustible.}}{\text{Moisture} \times \frac{1}{2} \text{ Volatile Combustible.}}$$

and reads as follows when quoted by Professor J. B. Porter, of McGill in the Investigation of the Coals of Canada:

$$\frac{\text{Fixed Carbon} \times \frac{1}{2} \text{ Volatile Matter.}}{\text{Moisture} \times \frac{1}{2} \text{ Volatile Matter.}}$$

Surely there is a great difference between volatile combustible and volatile matter, also in the present monograph the word volatile alone is used, which has no meaning whatever. As the first is the original, and I presume the correct one, we shall proceed to discuss it. As already mentioned there is no relation between fixed carbon and volatile matter. It is on this point, mainly, that this formula falls down. Secondly, it works on an inadequate, and to my mind practically useless analysis, known as proximate analysis. I have seen it time and time again used without first eliminating the ash and proportioning the other factors, and as the formulae has two factors which have to be added before the ratio is derived, it is a mathematical inexactitude to use the units of the analysis without first eliminating the ash and foreign matter. Few remarks are to be passed on this classification, for it will not apply with the coals in Europe, nor to many of the coals on this continent. For example, take the steam coals in Eastern Fifeshire, in Scotland. Here we are told that there is nothing but lignites if we use the split volatile ratio. A few of the seams are as follows:

| Seams. | Split Volatile ratio. |
|---|---|
| Barn craig tops | 2.30 |
| Barn craig bottoms | 2.02 |
| Coxtool | 2.31 |
| Chemiss splint | 2.07 |
| Chemiss sewel | 2.03 |
| Pilkembare | 1.66 |
| Brankstone | 2.08 |
| Bowhouse | 1.95 |

Charles Clapp, of the Geological Survey, in the Transactions of the Canadian Mining Institute, gave the analysis of a few of the Nanaimo coals. One of the analysis shows the split volatile ratio as 2.92, but he does not adhere to the classification resulting from the formulae, for he calls this coal a "bituminous coal of fair grade," and states that it yields a coke, the character of which is firm and coherent. This coal according to the split volatile ratio is a lignitic coal. Again, in the above quoted publication, a coal mined 200 miles from San Francisco is referred to in a paper by Foster Bain, on the "Fuel Problems of the Pacific." In the discussion of this paper R. V. Norris, of Wilkesbarre, and also by E. W. Parker, of the U. S. Geological Survey, state that this coal contains volatile combustible matter of 50 per cent. and fixed carbon of from 42 to 43 per cent., with low sulphur and ash, and they classify it as "a true bituminous non-coking coal." However, by the split volatile ratio method this coal would be classified as a lignite. Again Dowling's classification does not hold for cannel coal. From experience in different coalfields in various countries in the world, I have come to the conclusion that these abortive attempts to classify and subdivide coal by its chemical analysis is absurd and a useless waste of time. The old method of broadly classifying by physical properties is still the best. An examination of the following list it will be seen that no classification can be formed by chemical analysis:

Cannel coal conforms with none of the chemical classifications, nevertheless it is a true coal. I have seen many cases of splint coal having the same analysis as a steam coal, but yet these coals can never be classified by an engineer under the same heading. The splint coals are mostly microsporaceous while the steam coals, speaking in a wide sense, are megasporaceous; while again the spores of cannel coal are found to have been once highly resinous. This is the keynote for proper classification. The classification of coal cannot be performed in a chemical laboratory, it should be undertaken by the petrographer. Why are certain coals much more open in texture than others which lie within a depth of sixty feet of them, but yet contain practically the same chemical properties, the one being a good steam coal, the other being of practically no use but for household purposes? The petrographer can tell you what a chemist cannot. In Scotland we have the high oxygen long flame coal, while in Yorkshire, Durham and Northumberland we have coals contemporaneously deposited, with a base containing much lower oxygen and is different type of coal. It has been proved that the flora which went to constitute the Scottish fields was generally of a different nature to that of the English fields.

The Scottish coals I mention which are classified by the split volatile ratio as lignite, are judging from their chemical analysis, much poorer than the Belly River lignites of Canada; yet this type of coal is greatly exported to Northern Europe for the purpose of steam raising. In burning the Scottish steam coals you can always see slight belling of dark heavy oils when the coals are on the combustion. This is never seen when burning lignite.

But after all, why all this unnecessary classification? Coal is sold to steam raisers. All they require to know is how many pounds of water can be raised to steam from 212° F., by one pound of coal, and if the coal clinkers. The householder wants a coal that is clean to handle and at the same time has an ash heavy enough to remain in the grate or the ash pan, and not blow about the house. Until a proper petrographical classification is established, I prefer, therefore, to adhere to the old and simple method, whereby costs are known as anthracite, steam, household, cannel, lignite (brown-pitch).

TABLE SHOWING CHEMICAL ANALYSIS OF COALS

| | | C. | H. | O. | N. | S. |
|---|---|---|---|---|---|---|
| 1. | Steam navigation | 92.83 | 3.51 | 2.61 | .21 | .87 |
| 2. | Gas (Cannel) | 89.76 | 6.66 | 3.58 | * | |
| 3. | Gas (Cannel) | 88.50 | 6.11 | 5.39 | * | |
| 4. | Steam | 88.38 | 5.64 | 2.65 | 1.83 | 1.50 |
| 5. | Gas, coke, steam and household | 86.95 | 4.97 | 5.23 | 1.06 | .89 |
| 6. | Gas, navigation and coke | 86.80 | 4.63 | 6.81 | 1.02 | .89 |
| 7. | Gas (Cannel) | 85.81 | 5.85 | 8.34 | * | |
| 8. | Gas (Cannel) | 85.48 | 5.90 | 8.62 | * | |
| 9. | Steam | 85.23 | 5.68 | 5.82 | 1.57 | 1.70 |
| 10. | Gas (Cannel) | 85.20 | 6.17 | 8.63 | * | |
| 11. | Steam | 84.73 | 5.58 | 6.63 | 1.67 | 1.40 |
| 12. | Household | 84.13 | 5.60 | 5.70 | 1.30 | 3.27 |
| 13. | Gas (Cannel) Scotch | 84.03 | 9.15 | 6.82 | * | |
| 14. | Steam navigation | 84.01 | 4.96 | 8.78 | 1.30 | .95 |
| 15. | Steam | 83.95 | 5.24 | 8.17 | 1.51 | 1.13 |
| 16. | Household and gas | 83.89 | 5.95 | 7.56 | 1.79 | .81 |
| 17. | Household | 83.58 | 6.79 | 8.17 | 1.42 | .06 |
| 18. | Steam navigation coking | 83.16 | 5.12 | 9.33 | 1.28 | 1.11 |
| 19. | Household | 82.87 | 5.73 | 8.67 | 1.18 | 1.55 |
| 20. | Household | 81.71 | 6.30 | 7.20 | 2.27 | 2.52 |
| 21. | Navigation | 80.42 | 5.95 | 11.32 | .52 | 1.79 |
| 22. | Steam | 80.22 | 5.55 | 10.07 | 2.51 | 1.65 |
| 23. | Gas Cannel (Scotch) | 79.61 | 11.24 | 9.15 | * | |
| 24. | Gas Cannel (Scotch) | 78.44 | 8.90 | 12.66 | * | |

*Including nitrogen and sulphur.

## ASBESTOS ROOF STOPS CONFLAGRATION.

The ability of asbestos roofing to resist fire and check the progress of a blaze was again demonstrated by a fire which broke out in one of the sheds of the Export Lumber Company, Charlestown, Mass.

Due to the high wind blowing at the time, sparks and burning embers fell on the highly inflammable roofs of buildings for a radius of a quarter of a mile around. The result was a score of small fires that gradually grew until several acres were ablaze at one time.

The fire burned its way from the sheds of the Export Lumber Company to a large storehouse which is covered with asbestos roofing manufactured by the H. W. Johns-Manville Co. Falling embers and sparks had no effect on this roofing.

# PERSONAL AND GENERAL

Mr. Henry E. Allen, for four years silver mining in Mexico, left that country recently and is now at Victoria, B.C.

Mr. J. P. Keene, for several years manager of the Cariboo gold mine and stamp mill, in Camp McKinney, B.C., is now directing development work at the Wonderful silver-lead mine, near Sandon, Slocan district.

Mr. J. P. McFadden, formerly of Michigan, is now superintendent of the Surprise silver-lead mine, near Cody, Slocan, British Columbia.

Mr. J. W. D. Moodie, vice-president and general manager for the Britannia Mining and Smelting Co., Ltd., has returned to Britannia Beach, Howe Sound, B.C., from a trip to Montana and Utah.

Mr. John E. Rinta, after ten years' active connection, as foreman and superintendent successively, with the Rambler-Cariboo silver-lead mine, Slocan, B.C., has been appointed manager in successor to Mr. W. E. Zwicky, resigned.

Mr. Charles Graham, of Middlesboro, Nicola Valley, B.C., superintendent for the Nicola Valley Coal and Coke Co., has been appointed superintendent for the Corbin Coal and Coke Co., which is operating a coal mine at Corbin, Crow's Nest district, South-east Kootenay, also in British Columbia. He expected to take up his new duties about the middle of August. Mr. Robert Fairfoull, who has been overman at the No. 2 mine, Middlesboro colliery, is his successor as superintendent for the Nicola Valley Company.

Mr. W. M. Brewer, of Victoria, B.C., has gone to the Bridge River section of Lillooet district to investigate mining conditions there for the British Columbia Department of Mines. Mr. Donald G. Forbes is similarly engaged in the Coast district of that province.

Mr. H. H. Johnson, of London, is on Vancouver Island, B.C., where he is preparing to operate a copper property, to be known as the Ptarmigan mine.

Mr. Ralph S. G. Stokes was in Vancouver, B.C., recently.

Mr. W. P. Alderson, formerly in the metallurgical department at the Hollinger mine, Porcupine, is now general manager of the Motherlode Sheep Creek Mining Co., at Sheep Creek, Nelson mining division, B.C.

Mr. Ben Hughes, of Cobalt, was in Toronto last week.

Mr. Roy E. Margenau, instructor in metallurgy at the Michigan College of Mines, has accepted a position with the Buffalo Mines Co. at Cobalt.

Mr. A. A. Cole, of Cobalt, is in Toronto attending meeting of the International Geological Congress.

Mr. Ralph Scott, of the Dome Mines Company's staff, has been appointed mine engineer.

Mr. J. Swent has joined the engineering staff at the Murray mine in the Sudbury district.

Mr. H. Portis, who was for some time on the staff of the Jacobs Asbestos Mining Company at Thetford, is now in Chicago.

F. J. Jordan, manager of Moose Mountain Iron mine, visited Cobalt and Porcupine with the A3 excursion of the Geological Congress.

Dr. J. M. Bell is in Toronto.

Norman L. Bowen, formerly connected with the Bureau of Mines, Ontario, and now on the staff of the Geophysical Laboratory at Washington, D.C., is in Toronto for the Congress meeting.

Dr. H. S. Sjogren, the prominent Swedish authority on iron ores, visited the Moose Mountain iron mines with the A3 excursion.

Among those who visited the Quebec Asbestos mines on the A5 excursion this month were: Hans Arlt, Germany; Karl Boden, Germany; O. B. Boggild, Denmark; Leon H. Borgstrom, Finland; T. C. Denis, Canada; J. A. Dresser, Canada; L. L. Fermor, India; Mrs. L. L. Fermor, India; H. Frechette, Canada; S. McL. Gardner, Scotland; George Gurie, Germany; R. Harvie, England; R. E. Hore, Canadian Mining Journal; Jas. Howley, Newfoundland; Mark Hurll, Scotland; J. McG. Hurll, Scotland; J. P. Krusch, Germany; Andrew Lawson, U.S.A.; A. Mailhot, Canada; Dr. C. Palache, U.S.A.; Dr. Fred Von Grote, Germany; O. A. Welter, Germany; E. Wigglesworth, U.S.A.; J. E. Wolff, U.S.A.; Berkey, U.S.A.; Bain, U.S.A.; P. Fabrega, Spain; C. Kido, Japan; R. B. Murray, England; Dr. Edgar Wherry, U.S.A.; H. B. Wallis, England; P. Zoude, Belgium; A. G. B. Wilbraham, England; B. Weigand, Germany. Mr. T. C. Denis, Superintendent of Mines for Quebec, and Mr. J. A. Dresser, geologist for the Lake Superior Corporation, were the leaders, and they made the excursion a very interesting one.

H. B. Wallis and A. G. B. Wilbraham, mining engineers of London, England, were members of the Sudbury-Cobalt-Porcupine excursion, and will go west to the Pacific Coast and up to the Yukon after the Toronto meeting.

Among the members of the A3 excursion who visited the Kirkland Lake gold fields last month were Bedford McNeill, president, and A. G. Charleton, past president, of the Institution of Mining and Metallurgy.

## OBITUARY

Mr. Thomas G. Procter, managing director of the Lucky Jim Zinc Mines, Ltd., operating the Lucky Jim mine, near Bear Lake, Slocan district of British Columbia, was killed near his home at Oak Bay, in the vicinity of the City of Victoria, late on the night of July 9. He had taken the last car from the city and immediately after stepping off the car was struck by a passing automobile. When lifted to the sidewalk he was still alive, but expired before the arrival of the doctor a short time afterward. Mr. Procter was born in Lancashire, England, in 1862, and at the age of 14 years joined the British navy. Several years later he left the navy service and came to America where, in the middle Western States, he for some time was engaged in cattle ranching. In 1891 he went to the Kootenay district of British Columbia, with which he has since been actively connected steadily increasing his interests in the country and taking a prominent part in the development of its varied interests. During a long period of residence in Nelson, he did much to promote the advancement of that town, while his efforts were also directed toward the profitable utilization of the chief resources of Kootenay district—mining, lumbering, and the clearing and cultivation of land. He was one of a number who did much work and spent much money in developing mineral claims in Ainsworth and Slocan mining divisions of West Kootenay, and up to the time of his death he continued his activities in that direction. About two years ago he removed his office to Victoria and made his home in the neighbouring suburb of Oak Bay, paying frequent visits to Kootenay from the coast. Among numerous other affiliations, he was a member of the Canadian Mining Institute, and was one of the western members who attended its semi-annual meeting held in Victoria last September.

# SPECIAL CORRESPONDENCE

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Plant for Porcupine Crown Mine.**—All the machinery for the cyanide plant at the Porcupine Crown is on the ground, and the management confidently expects to have the enlarged plant running in six weeks' or two months' time. This will give it a capacity of about 100 tons per day.

Ten more stamps have been added. The concrete work for twenty stamps was finished at the time the first section was built, so that the other ten stamps had only to be erected, the building enlarged, and the cyanide plant added.

The present ten stamp mill is treating about 65 tons per day. During July it was making an extraction of 82 to 87 per cent., and with cyanidation it is confidently expected to bring that up to 95 per cent. at least. The ore is more free milling than at the Hollinger. Ore taken from development right across the drifts has run about $22 per ton. The July cleanup amounted to $25,000.

Plans for a refinery have been drawn, and the plant at the Porcupine Crown will be very complete by the time the snow falls.

**The Lucky Cross Mine at Swastika has shut down** in order to make alterations and repairs to the mill. It is also probable that there will be a change in the management. Just before closing down the richest shoot of ore ever encountered in the mine was opened up on No. 9 vein at the 100 foot level. The vein in the face of the drift is three feet wide and is full of free gold. Tests show the presence of telluride. This is the first indication of this mineral nearer than Kirkland Lake. The vein has been drifted on for about fifty feet and has shown consistent values, but it was not until the last shoots were put in a little while before closing that the high grade was encountered.

**Schumacher Opens a Good Ore Shoot.**—What promises to be one of the most important strikes of the year in the Porcupine camp has been made on the property of the Schumacher mine. At the 100 foot level the vein is five feet wide. Of this three feet is very high grade ore and two feet of $10 ore. It had at the beginning of the month been drifted on for twenty feet, and the face was as good as where the vein was first struck. Work at the Schumacher mine was last year hindered by an unfortunate accident, which made it impossible to drift further towards the lake on the 100 foot level. There was a change of mine management and Mr. Joe Houston counselled diamond drilling. This was one of the veins from which good cores appeared in the drill.

**Jupiter Mill.**—Owing to various reasons it has been decided to delay the building of the Jupiter mill. It will not be built this year. The working staff, which was at one time this summer the fourth largest in camp, will be reduced and underground development will proceed at a normal rate of progress.

**The McIntyre** has struck its vein at No. 5 shaft, 45 feet below the 200 foot level. The ore is said to be of an excellent grade. This will now provide another point from which the new mill can be supplied with ore. It is proposed to build an aerial tramway across Pearl Lake from No. 4 shaft.

**The Hughes Porcupine** is now sinking to the 400 foot level. About fifty feet of drilling has been done both ways from the winze. At the 300 foot level the vein is still good.

**Burnside Property.**—A rich but small vein has been found on the south lot of the Burnside property at Kirkland Lake. This claim adjoins the Wright-Hargraves property. The vein is not more than an inch wide on the surface, but the fissure has been traced for fifty feet and some very rich specimens have been taken out.

**Exploring Party Returns from Hudson Bay.**—Another party has returned from the east shore of Hudson Bay without finding either placer gold or precious stones. The party left Cochrane early in May and went to Rupert's House and their proposed destination via the Harricanaw. They arrived back in Cochrane at the end of July. While disappointed at the failure of the expedition, the members are optimistic as to the possibilites of the country as a field for exploraton.

**Vipond Mine.**—There is a possibility that the Vipond mine may be started up again shortly. It is understood that all outstanding debts have been met and that the shaft will be dewatered soon and work commenced. The mine has been shut down since the fall, when the strike disorganized labour.

**The Teck-Hughes** vein at the 100 foot level of that Kirkland Lake property has been cut and shows good high grade ore. It was found sixteen feet from the conglomerate porphyry contact. It is fourteen inches of typical Kirkland high grade ore. The shaft was put down on the vein, but it dipped out at about forty feet. A winze will now be sunk on the ore and the vein followed down to the 200-ft. level. As the vein on the surface has been traced and stripped for a thousand feet on the Teck-Hughes and the Wettlaufer, with good values on the surface, the strike at the 100 foot level seems significant.

**Tough-Oakes Finds More Ore.**—In cutting the station at the 100 foot level of the Tough-Oakes mine an additional four inches of high grade ore was encountered about nine feet from the main vein. A station and ore pocket is now being cut at the 200 foot level, and the shaft will be carried down with all despatch to the 300 foot level. Five claims in Teck and Lebel township, in which Mr. C. A. Foster has a controlling interest, have been incorporated into the Tough-Oakes Gold Mines, with a capitalization of $3,000,000, in 600,000 shares, with a par value of $5. Four hundred and fifty thousand shares have been paid to the original holders for the claims and 50,000 shares will be offered to the public at $4 a share in order to finance the building of a mill.

## COBALT, SOUTH LORRAIN, GOWGANDA AND ELK LAKE

### Concentration Methods at Cobalt.

At the reception given to the A3 excursion of the International Geological Congress by the Cobalt branch of the Canadian Mining Institute, Mr. Fraser Reid, of the Coniagas, gave a most interesting resume of the development of the concentration of Cobalt ores. Mr. Reid, as a patentee of a table that is making a marked gain in saving, was very competent to give this paper. He has been in charge of the Coniagas mill since its building, and has watched the various processes for the reduction of the ore as they were evolved. Mr. Reid is a graduate of Queen's, and had the distinction also of being one of the pioneers of the Cobalt camp. He has done much to bring the process of straight concentration to its present efficiency in the camp.

He stated to the visitors that to-day the camp has 500 stamps in operation, with a dropping weight of 625,000 pounds and roll mills to the equivalent of 150 stamps, giving a total dropping weight if all were stamps of 800,000 pounds of metal.

About 75 per cent. of the total ore milled is crushed by stamps, the stamps being in favour owing to the hardness and toughness of the ore, and simplicity and reliability of it as a crushing device.

After describing the process of straight concentration in detail, Mr. Reid said that up to the latter part of 1912 the cyanide process played a minor part in the recovery of silver. But with new additions to the Dominion Reduction mill and the advent of the Nipissing low grade mill the process had now become a more important factor in the production of the camp.

Amalgamation is employed in three mills, the Nipissing and Buffalo high grade mill treating high grade ore and concentrates, and the Dominion Reduction treating concentrates only. These mills recover the values in the form of marketable bullion. Amalgamation does not play any part in the recovery of values from the low grade ores.

There were thirteen mills in the camp using straight concentration, three using cyanide as an adjunct to concentration, the Buffalo mill cyaniding the slimes only, the Dominion Reduction and the O'Brien, which reground the sand tailings from the concentration process and cyanided the whole. One mill only, the Nipissing low grade, used an all sliming cyanidation process.

An analysis of the total silver production of the camp would show approximately the following figures: recovered by sorting underground, about 50 per cent.; recovered by preliminary treatment in mills, 20 per cent.; recovered by mechanical concentration after stamping, 17 per cent.; recovered by cyaniding, 13 per cent.

The ratio of concentration by mechanical concentration averaged 37 tons of ore to one of concentrates.

Mr. Reid also described lucidly the process in vogue at the Nipissing low grade and at the O'Brien mill, giving them as instances of divergence from the general practice in the camp.

Mr. A. A. Cole, now recognized as the authority on the statistics of the Cobalt camp, also gave an example of his versatility in exhibiting slides of veins underground. In their photographic perfection and completeness these are probably unique, and the visitors were delighted with the graphic nature both of the slides and the description Mr. Cole gave of them.

### Reception Appreciated by Geologists.

As indicative of the appreciation the geologists felt for the treatment they received at the hands of the local committee and the Cobalt mine owners, the following letter received by the committee speaks for itself:

"We, the undersigned members of the Twelfth International Geological Congress, wish hereby to tender and express to the local committee members, Messrs. E. V. Neelands, A. A. Cole, B. Neilly, Fraser Reid and Chas. Watson, our hearty appreciation and thanks for the thoughtfulness, hospitality and executive ability which have made so remarkably effective and delightful our visit to Cobalt, under the leadership of Dr. Miller, the godfather of the district. We beg to express also to the managements of the Coniagas, Crown Reserve, Beaver and Timiskaming mines and of the Nipissing high grade mill, and to the ladies, our appreciation of the cordial reception, worthy of so uniquely prosperous a mining district."

**Lumsden Mine.**—A twenty ton car of high grade ore from the Lumsden mine, now being treated at Campbell and Deyell's, is interesting, inasmuch as it is the first ore shipped from this property. Most of it has been stored for some time. The Lumsden property is controlled and very largely owned by Mr. John Lumsden, of Ottawa. It is situated on Brady Lake, adjoining the Rochester and the Badger, and is separated by one claim from the Timiskaming and the Beaver, the only two other producing mines in this portion of Coleman township. Short shoots of very rich ore have been found on the Lumsden property from time to time, and this has been taken out as it has been found. This is the ore that is now being shipped. It came from the 250 and 300 foot levels. Three drills are working on calcite veins, on the 225, 250, and 300 foot levels. While these veins have yielded some high grade ore, they now show only low values in silver.

**Orion Realty Company's Ore Seized.**—An unusual occurrence was witnessed in the camp this week, when a car of concentrates belonging to the Orion Realty Company was seized to pay debts. The car was valued at $11,000. The Orion Realty Company was working the old Silver Cliff property on a lease, but ran out of funds. The car has since been released and has gone to the smelters.

**Hudson Bay Output for June.**—Owing to the fact that operations at the Hudson Bay mine have necessitated the handling of much waste rock, the heads at the mill ran as low on an average as 20.20 ounces to the ton. This, of course, did not include high grade. The reduction for the month of June was 42,814 ounces, the ore concentrated amounted to 2,096 tons, mill heads, 20.20 ounces to the ton, tails, 3.60 ounces to the ton, extraction, 82.70 per cent.; ore crushed in 24 hours 77.6 tons. A fire during the last week in July destroyed the engine house at the Hudson Bay, and the output for that month will therefore be lower than usual, as operations had to be suspended. The Hudson Bay is one of the many Cobalt companies seeking new mining ventures. They are now stripping a vein on a property in Beattie township near Painkiller Lake, with a view to taking a working option on it if the vein fulfils expectations. They have, however, finally abandoned their claims at Hangingstone Lake, near Gowganda. They are starting work on some claims of their own staking at Kirkland Lake.

**The June Mill Report of the Buffalo Mines Reads:** Mill ran, 610 hours; ore milled, 5,955 tons; average assay per ton before milling, 31.15 ounces; ounces silver recovered, 161,331; ounces of silver paid for during the month, 33,621 ounces.

**The Mapes Johnston Mining Company,** working near Elk Lake, has bought the plant of the Montreal James, also an Elk Lake property, but long shut down. This fall the Mapes Johnston intend to open up their property on a larger scale, all working being carried on by hand so far.

# STATISTICS AND RETURNS

### Cobalt Ore Shipments.

The ore shipments for the week ending August 8th, with the classifications, are:

| Mine. | High. | Low. | Pounds. |
|---|---|---|---|
| Coniagas | 4 | 0 | 337,120 |
| Cobalt Townsite | 1 | 0 | 61,500 |
| Trethewey | 1 | 1 | 92,083 |
| McKinley | 2 | 0 | 129,500 |
| Cobalt Lake | 1 | 0 | 64,200 |
| Seneca Superior | 1 | 0 | 62,500 |
| Casey Cobalt | 1 | 0 | 45,000 |
| Timiskaming | 1 | 0 | 61,330 |
| Miscellaneous | 1 | 0 | 79,000 |
| Total | 13 | 1 | 932,233 |

The shipments from the Cobalt camp, for the year to date, are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Bailey | 5 | 1 | 158.15 |
| Beaver | 8 | | 237.43 |
| Chambers-Ferland | 3 | 4 | 223.77 |
| City of Cobalt | 4 | | 105.14 |
| Cobalt Townsite | 39 | | 1,411.65 |
| Cobalt Lake | 20 | | 644.08 |
| Buffalo | 2 | | 66.13 |
| Coniagas | 32 | | 1,073.83 |
| Crown Reserve | 14 | | 336.00 |
| Cobalt Comet | 24 | | 377.83 |
| Green-Meehan | | 1 | 12.96 |
| Hudson Bay | 10 | | 369.81 |
| Kerr Lake | 16 | 1 | 440.61 |
| LaRose | 37 | 3 | 1674.64 |
| McKinley-Darragh | 45 | | 1674.64 |
| Nipissing | 2 | 37 | 1132.85 |
| O'Brien | 9 | | 327.06 |
| Seneca-Superior | 6 | 3 | 280.69 |
| Silver Cliff | 2 | | 48.05 |
| Trethewey | 8 | 8 | 408.67 |
| Temiskaming | 11 | 3 | 362.64 |
| Casey-Cobalt | 5 | | 287.52 |
| Colonial | 1 | | 21.56 |
| General Mines | | 1 | 8.80 |
| Silver Queen | | | 169.89 |
| Wettlaufer | | | 122.26 |
| Miscellaneous | 3 | | 127.55 |
| Miller L. O'Brien | 2 | | 47.19 |
| Right of Way | 1 | 1 | 62.71 |
| Penn-Canadian | 4 | | 126.13 |
| Silver Bar | | 1 | 20.00 |
| Mann | 1 | | 20.00 |
| York Ontario | 1 | | 20.00 |
| Total | 305 | 64 | 12,289.12 |

The bullion shipments for the week ending August 8th, are:—

| Mines. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 106 | 129,164.73 | $76,530.10 |
| O'Brien | 27 | 25,125.00 | 14,394.78 |
| Kerr Lake | | 4,051.90 | 2,413.18 |
| Penn-Can. | 5 | 3,550.00 | 2,094.00 |
| Trethewey | 3 | 2,351.00 | 1,396.00 |
| Cobalt Comet | 3 | 1,434.15 | 847.00 |
| | | 165,676.78 | $97,675.06 |

The bullion shipments for the year to date are:—

| | | |
|---|---|---|
| Nipissing | 3,488,703.72 | $2,001,953.72 |
| Penn-Can. | 10,760.30 | 6,445.08 |
| Buffalo | 918,165.90 | 578,964.39 |
| Crown Reserve | 260,266.00 | 161,738.25 |
| Dom. Red. | 314,860.40 | 181,256.58 |
| Townsite | 10,909.00 | 6,647.00 |
| Miscellaneous | 3,920.00 | 1,623.00 |
| Timiskaming | 17,760.20 | 10,335.41 |
| O'Brien | 118,309.77 | 61,998.66 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 13,529.83 | 8,282.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 18,330.88 | 11,461.16 |
| Bailey | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston East Dome | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| | 5,202,558.70 | $3,056,793.29 |

## STATISTICS OF PENNSYLVANIA ANTHRACITE PRODUCTION, 1907-1912

| Year. | Quantity (long tons). | Value. | Average price per ton | Average number men employed | Average number days worked |
|---|---|---|---|---|---|
| 1907 | 76,432,421 | $163,584,056 | $2.14 | 167,234 | 220 |
| 1908 | 74,347,102 | 158,178,849 | 2.13 | 174,174 | 200 |
| 1909 | 72,384,249 | 149,181,587 | 2.06 | †171,195<br>‡166,801 | 205 |
| 1910 | 75,433,246 | 160,275,302 | 2.12 | 169,497 | 229 |
| 1911 | 80,771,488 | 174,952,415 | 2.17 | 172,585 | 246 |
| 1912 | 75,322,855 | 177,622,626 | 2.36 | 174,000 | 231 |

†State mining department figures. ‡U. S. census figures.

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

Toronto, Ont., Aug. 7, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 2.75 | 3.00 |
| Braden Copper. | 6.87½ | 7.00 |
| Giroux Copper. | 1.37½ | 1.50 |
| Goldfield Cons. | 1.62½ | 1.75 |
| Greene Can. | 6.25 | 6.50 |
| Chino Copper | 39.87½ | 22.50 |
| Inspiration Copper | 15.12½ | 15.25 |
| Ray Cons. | 19.00 | 19.25 |
| Nevada Cons. | 16.25 | 16.50 |
| Miami Copper | 22.37½ | 22.50 |
| Tonopah Mining | 4.25 | 4.37½ |
| Tonopah Belmont | 6.43¾ | 6.56¼ |
| Tonopah Merger | .70 | .71 |
| Standard Oil of N.Y. | 368.00 | 370.00 |
| Standard Oil of N.J. | 369.00 | 370.00 |
| Standard Oil Old Stock | 1075.00 | ..... |
| Standard Oil Subs | 750.00 | ..... |
| Yukon Gold | 2.06½ | 2.12½ |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .01½ |
| Crown Chartered | .00½ | .01 |
| Dome Extension | 7.00 | 7.00½ |
| Dome Lake | .35 | .37 |
| Dome Mines | 13.50 | 14.50 |
| Eldorado | ..... | ..... |
| Foley O'Brien | .20 | .23 |
| Hollinger. | 15.00 | 15.50 |
| Jupiter. | .26 | .28 |
| McIntyre. | 1.75 | 2.00 |
| Moneta. | .03 | .06 |
| North Dome | .25 | .40 |
| Northern Exploration | .50 | 1.50 |
| Pearl Lake | .33¼ | .34 |
| Plenaurium. | .75 | 1.00 |
| Porcupine Gold | .08 | .08½ |
| Imperial. | .01½ | .02 |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .02 | .02½ |
| Rea. | .15 | .30 |
| Standard. | ..... | ..... |
| Swastika | .03¼ | .04¼ |
| United. | .00½ | .01 |
| West Dome | .10 | .20 |

### Sundry.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 4.12½ | 4.50 |
| Canadian Marconi | 2.00 | 2.50 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey. | .07⅜ | .07½ |
| Beaver. | .32½ | .33 |
| Canadian. | .21½ | .23 |
| Chambers Ferland | .17½ | .19 |
| City of Cobalt | .49 | .50 |
| Cobalt Lake | .57 | .62 |
| Coniagas. | 7.10 | 7.60 |
| Crown Reserve, ex-div. | 2.40 | 2.50 |
| Foster. | .05 | .08 |
| Gifford. | .04½ | .05 |
| Gould. | .03 | .03¼ |
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| Hudson Bay | 69.00 | 74.00 |
| Kerr Lake | 3.50 | 3.65 |
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| Seneca Superior, ex-div. | 2.10 | 2.40 |
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## TORONTO MARKETS.

Aug. 11—(Quotations from Canada Metal Co., Toronto).

Spelter, 5½ cents per pound.
Lead, 5.75 cents per pound.
Tin, 44 cents per pound.
Antimony, 9½ cents per pound.
Copper, casting, 15¾ cents per pound.
Electrolytic, 15¾ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Aug. 11—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $19.20 (f.o.b. Toronto).
Midland, No. 2, $19.00 (f.o.b. Toronto).

Aug. 11—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, $7.50 per ton.
Coal, bituminous, lump, $5.00 per ton.

## GENERAL MARKETS.

Aug. 8—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $3.00 per ton.

Aug. 8—Tin, straits, 41.70 cents.

Copper, Prime Lake, 15.75 cents.
Electrolytic copper, 15.75 cents.
Copper wire, 16.75 to 17.00 cents.
Lead, 4.50 cents.
Spelter, 5.65 to 5.75 cents.
Sheet zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.37½ cents.
Aluminum, 22.75 to 23.25 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
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Quicksilver, $39.00 per 75-lb. flask.

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|---|---|---|
| July 25 | 59 | 27 3/16 |
| " 26 | 59⅛ | 27¼ |
| " 28 | 59⅜ | 27⅜ |
| " 29 | 59⅝ | 27½ |
| " 30 | 59⅜ | 27⅜ |
| " 31 | 59⅜ | 27⅜ |
| Aug. 1 | 59¼ | 27 5/16 |
| " 2 | 59⅜ | 27⅜ |
| " 4 | 59⅜ | .... |
| " 5 | 59¼ | 27 5/16 |
| " 6 | 59⅛ | 27¼ |
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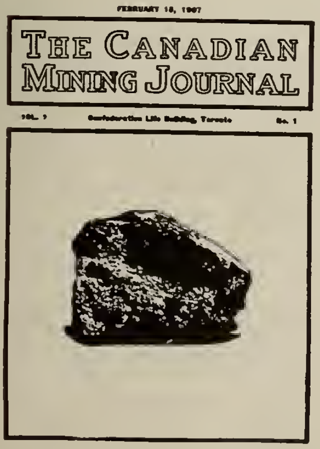


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Fraser & Chalmers, Ltd.
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Krupp, Fried. A. G., Germany.

**Forges—**
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Can. Fairbanks-Morse Co., Ltd.
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**Forgings—**
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Canadian Cleveland Drill Co.
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John McDougall Caledonian Iron Works.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
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Continued on page 36.

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**Heaters—Feed Water—**
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Can. Cleveland Drill Co.
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
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Mussens, Limited.
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Jenckes Machine Co.

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Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
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John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Co. of Can., Ltd.

**Link Belt—**
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Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—Electric—**
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Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
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Jeffrey Mfg. Co.
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Can. Fairbanks-Morse Co.
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Can. Laboratories.
Milton Hersey Co., Ltd.
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Northern Canada Supply Co.
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Mussens, Limited.
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Canadian Westinghouse.
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Peacock Brothers.
Jones & Glassco.

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E. Leonard & Sons.

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Mussens, Limited.
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American Diamond Rock Drill.
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Fraser & Chalmers, Ltd.

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Krupp, Fried. A. G., Germany.
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E. Leonard & Sons.
Northern Canada Supply Co.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

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Mussens, Limited.
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Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

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John McDougall Caledonian Iron Works, Ltd.
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Smart-Turner Machine Co.
Alex. Fleck.
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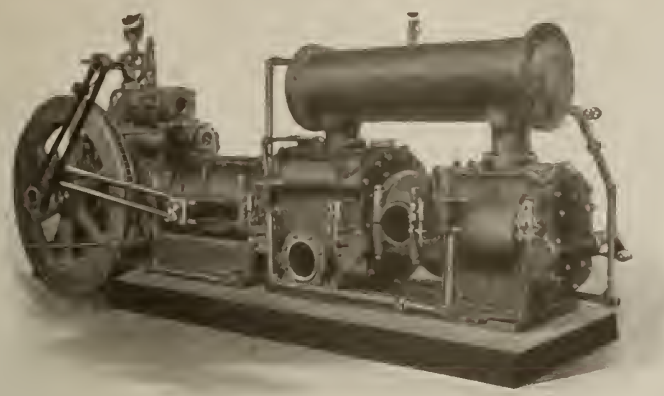

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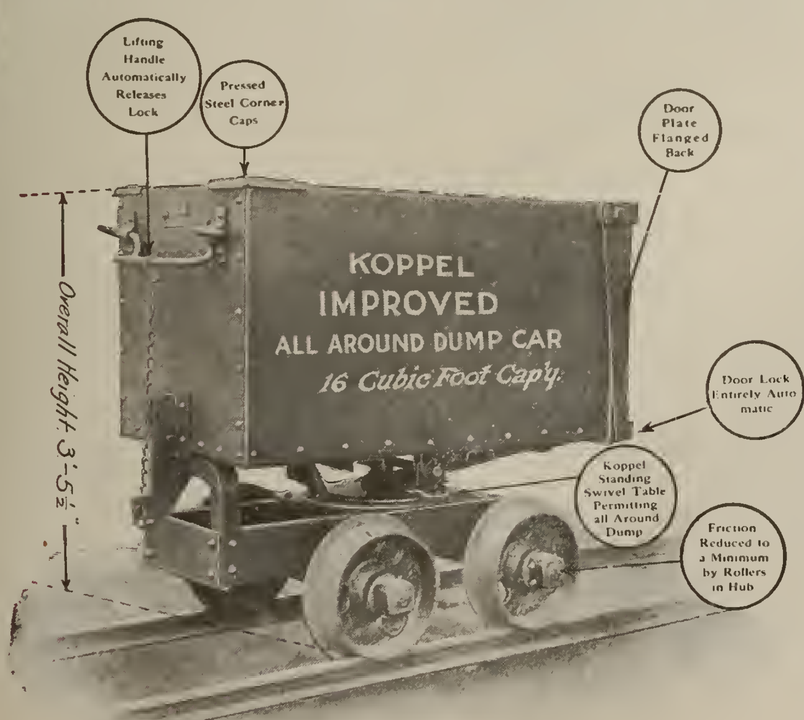


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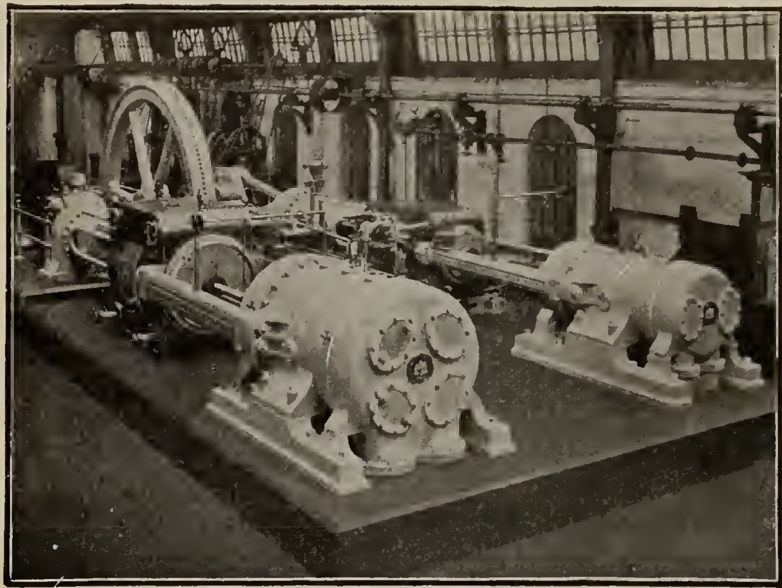

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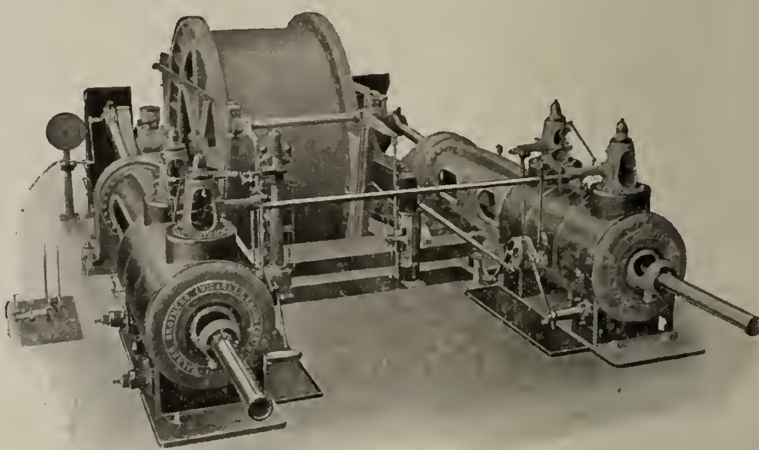

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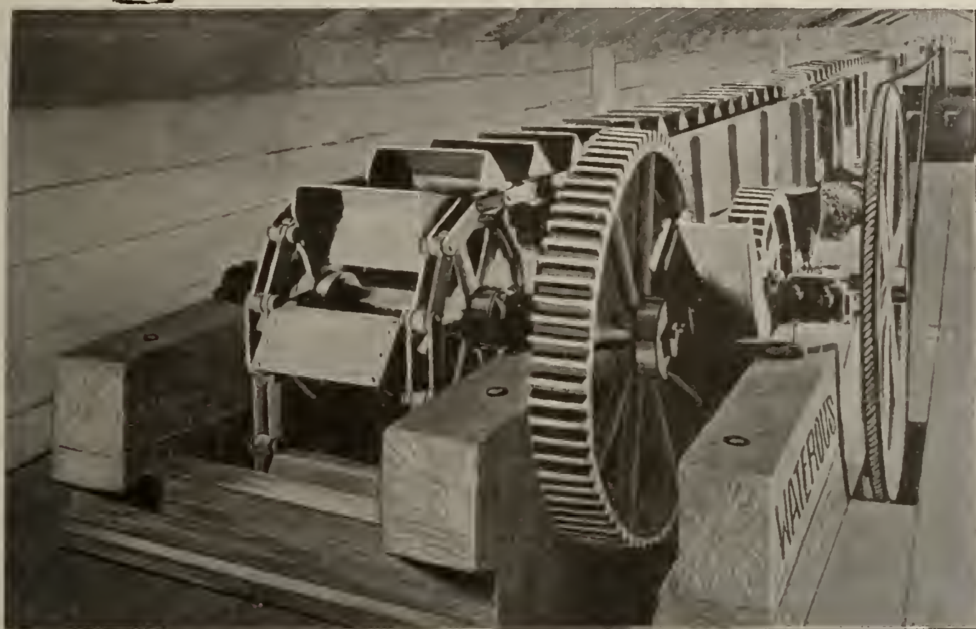


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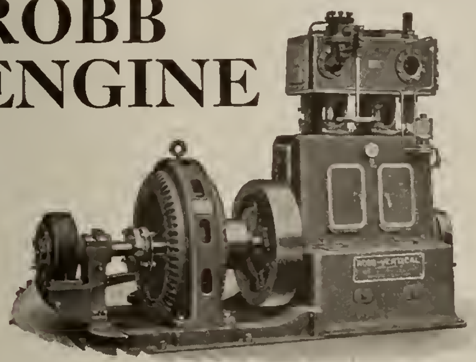

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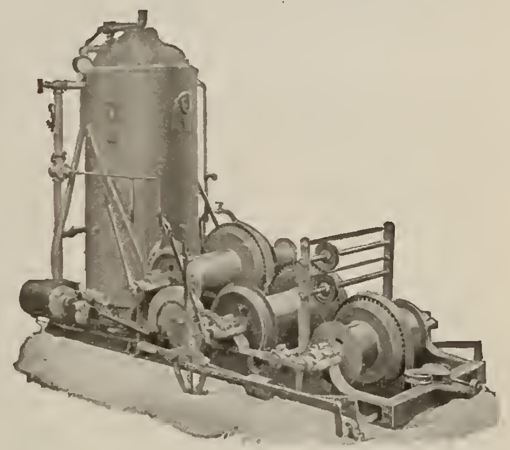

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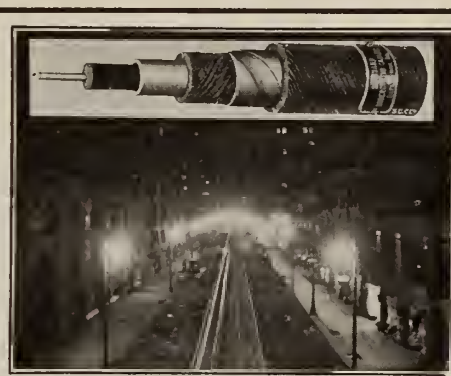

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# THE CANADIAN MINING JOURNAL

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CONTENTS.



## GENESIS OF BUTTE COPPER ORES

Mr. Reno H. Sales has prepared for the Butte meeting of the American Institute of Mining Engineers a very thorough description of the ore deposits at Butte, Montana. The general geology of the district, structural features, rocks, rock alterations, superficial alterations of the veins, ground-water, mineralogy of the veins, the ores, vein systems and genesis of the ores are discussed. The paper is accompanied by a series of instructive maps, which show the structural relations of the veins and fissures, important areas of rock alteration and distribution of ore shoots.

The origin of the deposits is believed by Mr. Sales to have been in the granite magma.

"The original source of the ores at Butte was the granite magma. Quartz-porphyry dikes formed a local closing phase of the igneous activity connected with the intrusion of the parent rock, and these dikes structurally and areally are in such close association with the ore deposits that they appear to be a direct factor in the localization of the ores. Heated waters and gases escaping from the cooling magma were the carriers of the metals to their place of deposition. The elements thus transported and deposited in the veins were cilicon and oxygen as $SiO_2$, sulphur, iron, copper, zinc, manganese, arsenic, lead, calcium, tungsten, antimony, silver, gold, tellurium, bismuth and potassium. Small quantities of potassium are believed to be added to the granite in the sericitization process. Other elements, as sodium, calcium, and manganese, were undoubtedly carried by these solutions, but, as shown by analyses, they were extracted from the granite in the alteration process instead of being added as in the case of the first-named elements.

"The chemical composition of these ascending waters varied in significant particulars as the process progressed. The granite wall rock was decomposed, furnishing much sodium, calcium, and possibly magnesium to the solution. Iron was also freed from the iron minerals of the granite to form pyrite with the sulphur of the invading waters. These interchanges affected the solvent capacity and character of the ore-bearing waters by the subtraction of the acid radical sulphur and the addition of alkaline radicals. While hydrogen sulphide and acidic conditions may have prevailed at the initial stages of ascent, the waters would tend to become alkaline through interaction with the wall rock. Along circulation channels, however, this action would gradually become less pronounced after a barrier built of sericitized granite had been formed bordering the fissures, thus protecting the solutions from further reaction with the fresh granite, and permitting the acidic conditions to ascend to higher horizons. Also, the earliest vein minerals, chiefly quartz and pyrite, would tend to insulate the solution from the granite. And finally, increasing alkalinity of the solutions and lower temperature would lessen action on the granite at points further removed from the central source.

Applying the above reasoning to the facts of ore occurrence, it is found that chalcocite as a primary mineral is the latest important copper sulphide of the ores; it is, moreover, found only in association with the highly altered phases of the granite. From these facts the conclusion may be drawn that under the geologic conditions existing in Butte, the more acidic conditions were necessary for the deposition of this mineral. Similarly, enargite is associated with highly sericitized granite, and is therefoie believed to have been deposited only under certain conditions pertaining to the temperature and relative alkalinity of the solution.

"Sphalerite, rhodochrosite, and galena are increasingly abundant toward the intermediate and peripheral zones, suggesting their formation under lower temperature conditions with relative high alkalinity. Quartz and pyrite are everywhere present, and evidently are formed under all conditions. Pyrite is more abundant in the central and intermediate zones than in the peripheral zone. Quartz is more prominent as a gangue mineral in the peripheral zone than elsewhere.

"Structurally there is no good evidence for distinct periods of mineralization in the Butte veins. It is here held that there was but one period of mineralization, varying in intensity, possibly, from time to time, with important changes in chemical character of solutions. But the mineralogical difference in vein material of the central, intermediate, and peripheral zones can be adequately explained, it is believed, by the reasoning herein set forth, which assumes that the copper mineralization indicates high temperature and acidic conditions versus lower temperature and alkaline conditions as the solutions migrated toward the peripheral fractures now represented by the manganese-silver veins.

"Concerning the formation of chalcocite there is much geologic evidence, mainly structural, to support the theory above outlined, which assigns to this mineral a primary origin from deep-seated waters."

The subject of chalcocite formation is of exceptional interest and is given special treatment by Mr. Sales. He does not agree with Mr. Weed, who considers the Butte chalcocite to be secondary.

"W. H. Weed has set forth some facts which, in his opinion, tend to prove the secondary origin of the Butte chalcocite. He observes generally that the old quartz-pyrite veins were originally of very low grade and they became commercially valuable through the later addition of enargite, bornite, chalcocite, and other copper minerals. He believes that this copper mineralization followed various periods of faulting, the enargite and bornite being the first to appear, probably contemporaneous in a general way with the Blue and Steward fault system. Chalcocite, which forms the bonanza ores of the district, is thought by him to have been almost entirely a product of descending sulphide enrichment processes, acting at great depths, however, only where the older quartz-pyrite veins were crackled and broken by faults, thus permitting a ready passage for the downward-seeping waters. He cites many examples of such intersections of faults and older veins in support of this view, and maintains that the old quartz-pyrite veins are workable only where thus fractured.

The writer's own observations do not confirm Weed's conclusions as above outlined. Actual examination of a great many intersections of old quartz-pyrite veins by later faults have shown conclusively that as a general proposition the east-west veins are no richer at or near intersections with Blue vein faults than at other points along the vein except in cases where the fault vein ore shoots cross the older vein. It is extremely difficult to form even an approximate idea as to the extent of primary enrichment in the older veins due to the late faults of the Steward system. Mineralization processes were active in the early veins prior and subsequent to the Blue vein period, so that it is impossible to determine, in the absence of any characteristic minerals, what influence was exerted by the later faults upon the older veins. As might be expected, the fault vein intersections are usually accompanied by a breaking and shattering of both the older vein and the country rock in the immediate vicinity, thus developing favourable factors tending to greatly influence ore deposition at such points. In any case, where a chalcocite enrichment of a vein of the Anaconda system is shown to have resulted from the influence of an intersecting fissure of the Blue or Steward system there remains the strong probability that such enrichment is due to primary waters, if, as believed by the writer, the primary chalcocite was deposited in great quantities, after the appearance of these faults, not only within the faults themselves, but in the fractured older veins."

## ASBESTOS MINING

The Black Lake, Thetford and adjoining districts in the Eastern Townships of the Province of Quebec, produce about 90 per cent. of the world's supply of asbestos. The industry is a large one; but of late years the financing in connection with the merging of several of the companies has brought it into well deserved disrepute. Overcapitalization accompanied by over production of the mineral, brought trouble to both those who were responsible for the manipulation and to those who were conducting their business on a sensible basis. The market did not absorb the uncalled for increase in production, and prices fell to unnatural low levels, when buyers discovered that the sellers were over-stocked.

Reorganization and saner methods of conducting the business have happily resulted in bringing the industry recently into a much improved condition. A good and steadily increased demand is being found for asbestos. New uses are being found for the lower grades, which are more difficult to dispose of than the long fibre. To-day the mines are busy and the outlook is bright. It is to be hoped that the lesson has been learned. Naturally the industry should become yearly a larger one. The reserves of mineral are enormous, and the uses are rapidly increasing.

# SUDBURY-COBALT-PORCUPINE EXCURSION

Continued from Aug. 15th Issue

The A3 excursion train of the International Geological Congress arrived in Cobalt Sunday evening, July 27th. In the morning a trip was made on foot to visit exposures in the vicinity of Cobalt and Cart lakes. The first stop was made at the Little Silver mine, where one of the first discovered veins has been worked out. The old workings give a very good idea of the structure of the silver deposits, and of the sedimentary rocks, which comprise the Cobalt series. A narrow vertical vein has been removed by mining just enough of the rock to allow the rich ore to be taken out. It was worked before concentrators were available, and only high-grade ore was saved.

The rocks in which the opening was made are, in ascending order, a well laminated mud rock or argillite, a gray quartzite and a massive conglomerate, containing pebbles of numerous types or rock, granites being especially noticeable. The Cobalt series has usually some conglomerate below the argillite, but the exposure in Little Silver cliff does not show the lowest part of the series. A photograph of the exposure was reproduced in the August 1st issue of the Journal. Near the base of the hill there is a fault displacing the vein a few feet to the south.

A short distance from the Little Silver vein, close to the T. and N. O. railway track, exposures were then examined, which show the conglomerate which forms the base of the Cobalt series lying on Keewatin rocks. All such exposures were critically examined by those interested in the origin of the Cobalt conglomerate, and proved productive of much discussion on the probable glacial age in Huronian times.

### The Provincial Mine.

The party next visited the Provincial mine, where Dr. Miller told of Ontario's experience in the mining business. At the time when silver was first discovered at Cobalt, a large section, known as the Gillies' limit, lying south of the Nipissing property, was not open to prospectors. The Government had sold to lumbermen the timber on this property, and it was not considered fair to the purchasers to allow prospectors to work there until the timber had been removed. Owing to its location, the northern portion of the timber limit was considered very valuable mining property, and the problem of disposing of it properly became a vexatious problem. The Government decided to prospect on its own account, and in 1906 Dr. Miller, the Provincial Geologist, was given charge of the work. Much of the area was found to be of little value, but finally a very promising vein was discovered. Having assumed the role of prospector, the Government now undertook to do some mining, and the then inspector of mines, Mr. E. T. Corkill, was given charge of the mining operations. Some rich ore was taken out; but the development work showed that the deposit was much leaner at depth, and the mine was never a large producer. The Government then sold the mine and several adjoining lots by tender, and went out of the mining business.

From the Provincial the party proceeded along the shore of Cart lake. On the rock dumps at the south end of the lake, the conglomerate was found to be not strongly cemented and pebbles were easily freed from the matrix. Numbers of them were examined for possible glacial markings, and a general discussion of the causes of striations on pebbles ensued.

### Diabase Contracts.

The party next visited an old adit driven in at the base of Diabase mount at the contact of the diabase sill, with the underlying argillite. Dr. A. C. Lane was especially interested in this exposure, and took several specimens of diabase from measured distances to study from the standpoint of his theory of the grain of rocks.

The party then turned north to Peterson lake, where Dr. Miller pointed out exposures of diabase lying on the older rocks near the west shore of the lake. The several exposures give unmistakable evidence of the sill-like character of the diabase mass.

### Exposures on the Nipissing Property.

In the Keewatin rocks, Mr. Knight pointed out lawprophyre dikes, which have a decidedly conglomerate appearance, owing to the enclosure of numerous fragments of lighter coloured rocks.

A large portion of the Nipissing property has been washed clean of debris, and presents numerous excellent exposures of Huronian and Keewatin rocks. Near the pumping station on Cobalt lake, some of the party were shown excellent exposures of ripple marked quartzite overlain in places by thinly laminated argillite, and in other places by argillite containing numerous large boulders, some of which lie almost immediately upon the ripple-marked surface. The most evident explanation here is that the conglomerate has been formed under water in which fine silt and sand were accumulating while icebergs dropped numerous boulders.

### Visits to Timiskaming, Crown Reserve and Coniagas Mines.

In the afternoon, the party was divided into three groups, and the Timiskaming, Crown Reserve and Coniagas mines were visited. At the Timiskaming a rich shoot of ore has recently been taken from the diabase, which here underlies the Keewatin rocks. The 650-foot level was visited to allow examination of this vein.

At the Crown Reserve mine some typical high-grade veins were seen, and Mr. Cohen gave some account of the development of this wonderful property, which until recently has paid over $1,000,000 yearly in dividends. The mine has produced at the end of last year 15,227,143 ounces of silver, and promises to make a further very large production, though the production from the Carson

**AT COBALT, ONT.**

**Examining the wall rocks of the Little Silver vein Nipissing mine**

vein during the past few months has been very dissappointing. It is planned to drain the lake this summer, to allow of recovery of ore under Kerr Lake. The necessary preparations are now being made, and it is expected that in two months after the pumps are started, the water will have been removed.

After coming up from the mines the members were entertained by Mrs. Cohen at Crown Reserve, and Mrs. Rogers at the Coniagas. Tea was served, and a very pleasant half-hour was spent before returning to the train.

In the evening the local branch of the Canadian Mining Institute, tendered the visitors a reception at Massey Hall. Mr. A. A. Cole described some of the characteristic features of the silver veins, illustrating his talk by projected views of some of his excellent underground photographs. Mr. Fraser Reid presented a much appreciated paper on the treatment of the Cobalt silver ores. Chairman Neelands called upon some of the visitors for a few remarks. Mr. Chas. McDermid, Secretary of the Institute of Mining and Metallurgy; and Mr. G. A. J. Cole, Director of the Geological Survey of Ireland, commented on the remarkable richness of the Cobalt mines, and were pleased to have an opportunity of thanking the citizens of Cobalt for the splendid reception accorded the excursionists.

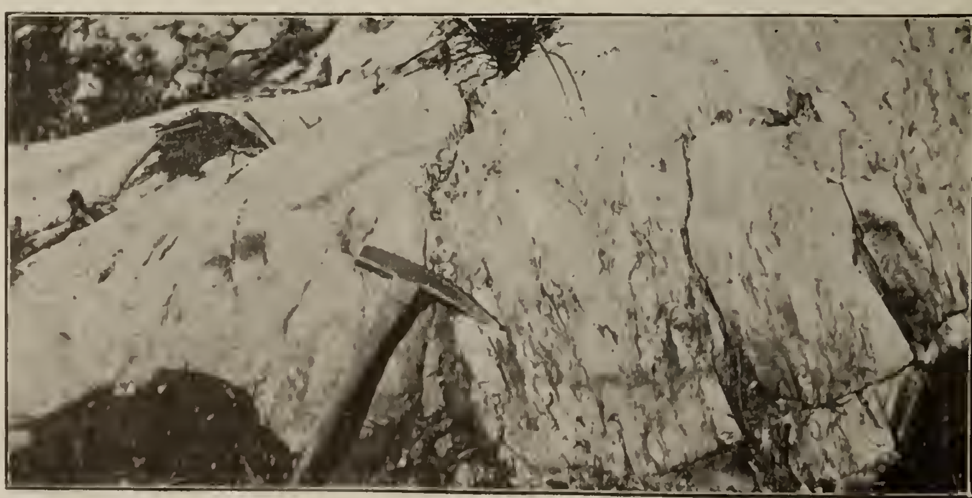
Refreshments were then served, and dancing concluded a very much appreciated evening's entertainment.

On Tuesday morning those who had visited the Timiskaming and Crown Reserve, went underground at the Coniagas mine. Here the best example of the mode of occurrence of the silver ore was seen. The party was conducted through the stopes, and saw the numerous thin but rich vertical veins in the sedimentary rocks. The method of mining these was described in the August 1st issue of the Journal.

### Nipissing High Grade Plant.

While some were underground at the mines others were taken through the remarkable plant in which the high-grade silver ore of the Nipissing mine is so successfully treated by a combined amalgamation-cyanidation process which will be described in a later issue of the Journal.

In the afternoon the train proceeded to Haileybury, and a steamer trip was taken down Lake Timiska-



**AT DOME MINE, PORCUPINE; ONT.**

**Contact of ellipsoidal Keewatin greenstone, at left, with Timiskaming conglomerate, at right.**

AT DIXON MINE, PORCUPINE, ONT.

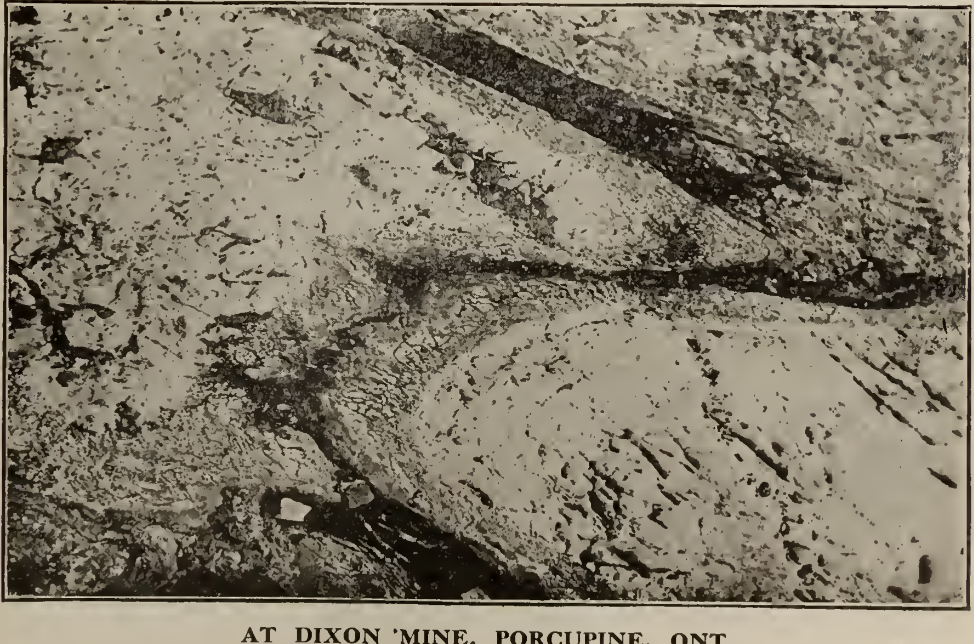
An outcrop of ellipsoidal Keewatin greenstone.

ming. Several exposures near the shore were examined, and the sail on the lake proved very enjoyable.

### Visit to Kirkland Lake.

While the greater number were on the lake, fifteen members of the party went on by special train to Swastika to see the recently discovered gold deposits at Kirkland lake, described in the July 15th issue of the Journal. At the station, Mr. Foster had stages awaiting the party. The road has been only recently made and is not yet completed, and the visitors were able to see a Northern Ontario mining camp in the making. The first few miles are fairly good for a new road, but for some reason the work has been discontinued about one mile from the Tough-Oakes mine, and is almost impassable for loaded wagons. The visitors, however, were men used to rough tramping, and were much pleased with their journey out. It offered an excellent opportunity to judge of the character of the country in which the new finds have been made and presented some of the difficulties to be encountered by those who are opening up the district.

The property was reached late in the afternoon, and Messrs. Foster, O'Connell, and Hotchkin aided Mr. Burrows, who is making a geological study of the district for the Ontario Bureau of Mines, in pointing out the geological features. The veins and the country rock were closely examined, and many interesting specimens obtained. In the article published in the July 15th issue, the writer called attention to an abundance of black graphitic material in the ore. Mr. Foster stated that analyses show this to be partly, and perhaps wholly, molybdenite. Specimens were obtained, which show the characteristic features of this mineral, and Dr. Walker suggested that some of the black graphitic looking material may be a mixture of molybdenite with crushed rock. Mr. Chas. Spearman stated that tests on some of the material showed



AT DIXON MINE, PORCUPINE, ONT.

Keewatin greenstone showing ellipsoidal structure characteristic of submarine volcanic rocks.

**AT HOLLINGER MINE, PORCUPINE, ONT.**

**The A 3 party visiting the large quartz outcrop where the gold was discovered in 1909.**

molybdenite in some cases and graphite in others. Another feature which attracted considerable attention was the character of the tellurides which occur in the ore. Mr. Foster stated that in some material analyzed by Messrs. Campbell and Deyell, of Cobalt, it was found that none of the gold occurs as telluride, but that some native gold is mixed with lead telluride. Some of the party collected specimens which they consider to be tellurides containing gold, and Mr. Spearman stated that he has obtained gold, silver and lead globules on roasting some clean particles of the minerals. He believes that the ore contains a telluride containing all three metals.

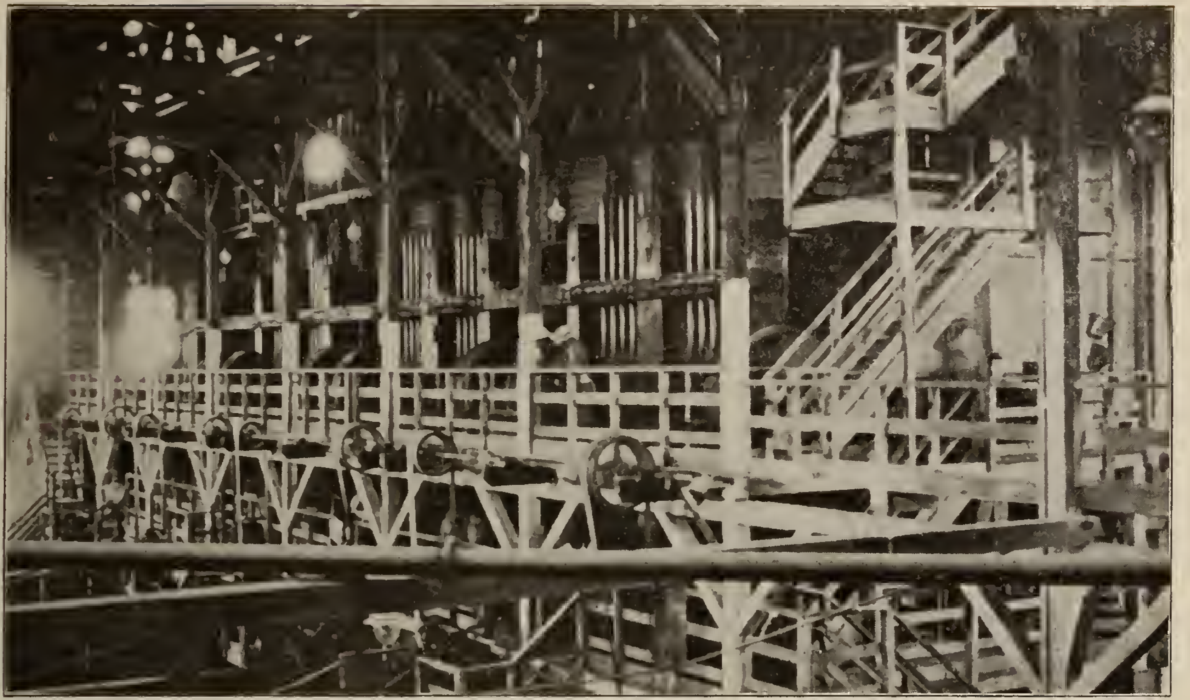
After examining the outcrops on the Tough-Oakes property, a visit was made to the Burnside property, where similar ore was seen. At the Burnside a shaft is being sunk on a recently discovered vein. It is a dark-gray vein a few inches in width, enclosed in gray conglomerate similar to that on the Tough-Oakes property. The vein, so far as opened, is nearly vertical and apparently conforms to the bedding of the conglomerate. It varies much in thickness, and is in places very rich.

About 8 p.m. the much interested visitors were reminded that they had not yet had supper, and were invited to partake of the hospitality of a Northern Ontario mining camp. A splendid meal was furnished by the Tough-Oakes company, and was done full justice to. At its conclusion, Mr. Bedford McNeill in a few words presented the hearty thanks of the party, and Mr. Foster in reply, stated that all Canadian mining men were pleased to have such visitors, and wished them a pleasant and interesting visit to the other mines.

Immediately after supper the party was taken underground to see the No. 2 vein at the 100-foot level. The cutting of a station here has exposed the vein well and gave a good opportunity for examination. In cutting into the hanging wall, another thin vein of good ore has been recently exposed.

Without going to the bottom of the mine, the party returned to surface and started for Swastika. The

**Breaking down gold quartz in open pit, Dome Mine, Porcupine, Ont.**



The 8 Stamps, Hollinger Mill, Porcupine, Ont.

first mile's walk in the dark over the unfinished portion of the Government road, gave the foreigners some new sensations and brought to those familiar with the district vivid recollections of the Porcupine trail, as it was in 1910. Without serious mishap, the party reached Swastika before midnight, and about an hour later were picked up by the excursion train and taken on to Porcupine.

### Dome Mine.

On Wednesday morning we looked out on the blackened tree trunks and scorched ground north of the Dome mine. The train was later run in close to the mine workings, and the mine officials joined Mr. Burrows in conducting the party over the property. First the rich ore, known as the "golden stairway," was examined. The most spectacular surface showing of gold has been removed, not by members of the party; but similar coarse gold was seen by descending a few feet into a raise which has been brought to surface in the rich ore.

The party then visited the open pits, where there are numerous excellent exposures of gold quartz and wall rocks. The irregular shape of the large quartz masses and intricate structure of the veins was pointed out by Mr. Burrows and the mine officials.

Mr. Burrows then conducted the party to several exposures near the mine, where the contact between the Dome conglomerate and the underlying Keewatin rocks can be seen. As pointed out by the writer in the October 15, 1910, issue of the Journal and in a paper presented at the 1911 meeting of the Canadian Mining Institute, the conglomerate is quite unlike that in which the silver veins at Cobalt occur. It seems to overlie the Keewatin greenstones, and may be either a sedimentary series of late Keewatin time or of early Huronian, or, as suggested by Dr. Coleman, may perhaps be not properly correlated with either Keewatin or Huronian. Mr. Burrows and Dr. Miller correlate it with similar rocks near Cobalt, and call the series of which it forms a part the Timiskaming series. They

Ellipsoidal Keewatin greenstone, Porcupine, Ont.

**AT DOME MINE, PORCUPINE, ONT.**

**Examining "golden stairway" vein**

S. Cerulli-Irelli, Italy; F. L. Ransome, Washington; Fred Searls, Nevada; A. G. Burrows, Toronto; H. F. Bain, California; A. C. Lane, Mass.

do not assign it definitely either to Huronian or Keewatin.

The writer in order to locate its position with relation to the Huronian series in Michigan, would correlate the Timiskaming with Lower Huronian, and the Cobalt series with Middle Huronian. There is, however, a possibility that the Timiskaming is considerably older than any of the known Huronian.

The Bureau of Mines geologists have found according to their published reports plenty of evidence that the Timiskaming series is older than the Cobalt series and younger than the Keewatin greenstones; but do not consider that there is sufficient evidence on which to correlate these series with those of the original Huronian area.

After Mr. Burrows had pointed out the exposures showing the relationships of the rocks and the character of each series, the mine officials took some of the party underground, while others inspected the mill and cyanide plant.

Much of the ore thus far milled at the Dome mine has been broken down in open pits, drawn off at the 45-foot level, trammed by mules to an inclined shaft, and thence hoisted to the surface. Here it is crushed and then elevated to the mill bins.

At the 100-foot level the deposit has been extensively blocked out by drifts and cross cuts as at the 45-foot level. It is not intended to hoist the ore from deep levels up the inclined shaft, however. The vertical No. 2 shaft, now about 300 feet deep, will be made the

**AT THE EDGE OF OPEN PIT, DOME MINE, PORCUPINE**

H. S. A. Sjogren, Sweden; P. P. Piatnizky, Russia; H. F. Bain, California; J. J. Barrell, New Haven.

main hoisting way, and the ore will be trammed on surface from this shaft to the mill.

After a busy morning at the Dome mine, the party boarded the train and was taken to Timmins. Immediately after lunch Mr. Burrows conducted the party to the numerous exposures on the Miller-Middleton, Hollinger and Dixon properties. The characteristic features of the ore deposits were pointed out and typical rock types were examined. Some excellent exposures of Keewatin greenstones showing ellipsoidal structures were shown on the Dixon property.

Having viewed the surface, the underground openings at the Hollinger and McEnaney were then examined. At the Hollinger a great deal of work has been done, and the party was conducted through a

**Head frame at Tough-Oakes Mine, Kirkland Lake, Ont.**

maze of drifts and cross cuts, in which splendid exposures of the gold quartz and enclosing rock were seen.

The most common wall rock of the ore-bearing veins is a fine grained gray rock, composed largely of sericite, carbonates and quartz. It is largely secondary and is probably an alteration product of quartz porphyry or feldspar porphyry. Considerable interest was evidenced by those who examined this rock, as its original character has been almost entirely obscured by secondary changes. Mr. Knight in his early work in the district, described it as probably an altered quartz porphyry, and the writer in a paper on the nature of the ores and rocks presented at the 1911 meeting of the Canadian Mining Institute, confirmed Mr. Knight's observation.

Having visited the underground workings, the party was then conducted through the Hollinger mill and cyanide plant. The process of treatment was described by the guides. The officials of the company did much to explain all that was seen on the surface, underground and in the mill, and the courtesy was much appreciated. Before leaving the property, the visitors were invited to view the mine maps and a glass model of the workings which is now being constructed.

### At Temagami.

During the night the train was moved down to Temagami. The morning was spent in a delightful sail down the lake to Temagami Inn and Bear Island. At Bear Island there is a Hudson's Bay Company post and an Indian village. Much interest was manifested in the Indians, some of whom were found at their tents making moccasins, curing hides, etc. An amusing little bear cub, belonging to Chief White Bear, attracted great attention, and one of the Toronto ladies with no great difficulty induced her husband to purchase it as a mascot for the Congress. During the afternoon, most of the geologists were busy examining outcrops in the vicinity of Temagami; but the natives gathered around a well known explorer, who was amusing himself and spectators on the station platform with his new-found pet. When the train started south, the pet, labelled "a bear called Congress," was in a box addressed to 14 Walmer road.

While the bear was being looked after at the station, Dr. Miller and Mr. Knight were conducting members of the party to exposures of the jaspilite, which forms the ridge paralleling the northeast arm of Lake Temagami and to exposures of the contact of Huronian conglomerate with the underlying Keewatin schists. These exposures, of some of which photographs may be seen in the Journal of Geology, 1910, were examined especially with a view to obtaining evidence of the origin of the conglomerate. Dr. Ransome electrified one group of searchers by finding what appeared to be a glaciated surface under the conglomerate; but which was soon found to be quite similar to a lower surface in the Keewatin rocks, and probably smoothed by a slipping action at the contact. Similar exposures were pointed out further south by Mr. Knight, and much discussion of the principles of sedimentation was brought out by the examinations. Most of the party seemed to be of the opinion that the deposits are glacial. Some, however, including Dr. Miller, hesitated to accept this view until more evidence has been found. At Doherty, Mr. Knight pointed out an excellent exposure of the conglomerate lying on granite and containing large boulders of the latter. Similar exposures occur a few miles west at Herridge lake.

The examination of the basal conglomerate concluded what every member of the party voted a very interesting and instructive excursion. The trip was admirably arranged and carried out and a vote of thanks to leader, guides and secretary, proposed by Mrs. Tyrrell, was heartily seconded. The railway men also received much well deserved praise for the manner in which the train was handled.

From Temagami the party proceeded to Ottawa, where, joined by members of A1 and A2 excursions and several new arrivals, a day was spent as guests of the citizens of Ottawa, the Dominion Government and the Geological Survey. On Saturday the members were entertained at Montreal by the Montreal local committee. The splendid reception accorded to the visitors in these two cities has been recorded elsewhere in this issue.

# MILLING PRACTICE IN COBALT CAMP*

By Fraser Reid.

In the first three years of the life of the camp, there was practically no attempt made to recover the values locked up in the low-grade ore. A large percentage of the ore was sacked underground and the balance hoisted to the surface and washed, the high-grade being hand sorted, the low-grade going to the dump. Later sorting houses were operated. Here the ore passed over a grizzly, the resulting fines averaging 125 ounces being shipped direct to the smelter. The oversize passed on to a bumping table where the first-class ore of from 2,000 to 4,000 ounces, and second-class ore averaging around 400 ounces to the ton were sorted out by hand and the discards with a value of from 15 to 30 ounces went to the low-grade dump. It was this rapidly accumulating low-grade product that caused the mine operators considerable concern and in the fall of 1907 the first concentrator in the camp started to operate on this low-grade ore. It was a five-stamp mill, built and operated by the McKinley-Darragh Mining Co., and had a capacity of from 12 to 15 tons per day.

Shortly after this the Coniagas Mill started, with a capacity of 60 tons per day; then followed the Buffalo, Cobalt Central and others, until today we have seventeen mills in operation, with a total daily capacity of 2,000 tons, producing silver at the rate of 14,000,000 ounces per year, or nearly 50 per cent. of the camp's present production.

To-day the camp has 500 stamps in operation with a dropping weight of 625,000 pounds and roll mills to the equivalent of 150 stamps, giving a total dropping weight (if all were stamps) of 800,000 pounds of metal.

The general practice in the camp is to hand-sort the high-grade ore in the mine as closely as possible and send the remainder containing a portion of vein matter to the mill. Here it is crushed in breakers, sized, and given a preliminary treatment on jigs and reciprocating tables and in some cases further hand-sorting is resorted to. This preliminary treatment before fine crushing usually yields from 30 to 50 per cent. of the total values milled and practically means the recovery of vein matter. The wall rock containing finely disseminated minerals and fine leaf silver passes on to the regrinding machines for further reduction and concentration.

About 75 per cent. of the total ore milled is crushed by stamps, the stamps being in favour owing to the hardness and toughness of the ore and the simplicity and reliability of the stamp as a crushing device. The stamps in some cases are followed by tube mills. The remaining 25 per cent. of ore is crushed in rock breakers, further reduced by rolls or their equivalent and finally ground to the desired size by Chilian or Hardinge mills.

In straight concentration mills this re-ground material is classified, the sands treated on Deister, Wilfley or James tables and the slimes on James and Deister slimers or Frue vanners.

In some mills the tailings from the slimes are re-treated on canvas tables, when a further recovery at a profit is possible.

Up to the latter part of 1912 the cyanide process played a minor part in the recovery of silver, but with new additions to the Dominion Reduction mill and the advent of the Nipissing low-grade mill, this process has now become a more important factor in the production of the camp. Owing to their complex nature, the cyaniding of Cobalt ores presents unusual difficulties, and it is in this field that the greatest advances have been made in the development of new processes.

These are of sufficient importance to warrant fuller discussion and will be referred to presently.

Amalgamation is employed in three mills, the Nipissing and Buffalo high-grade mills treating high-grade ore and concentrates, and the Dominion Reduction treating concentrates only.

These mills recover the values in the form of marketable bullion, thus dispensing with smelting.

Amalgamation does not play any part in the recovery of values from the low-grade ores.

In the treatment of low-grade ores in this camp two processes are used, mechanical concentration and cyaniding, some idea of their relative importance may be gained from the following considerations. There are thirteen mills in the camp using straight concentration. Three use cyanide as an adjunct to concentration, namely, the Buffalo mill, cyaniding the slimes only, and the Dominion Reduction and O'Brien, which re-grind the sand tailings from the concentrating process and cyanide the whole.

One mill only, the Nipissing low-grade, uses an all-sliming cyanidation process after stamping.

An analysis of the total silver production of the camp would show approximately the following figures.

Recovered by sorting underground about 50 per cent.

Recovered by preliminary treatment in mills, 20 per cent.

Recovered by mechanical concentration after stamping, 17 per cent.

Recovered by cyaniding, 13 per cent.

The ratio of concentration by mechanical concentration averages 37 tons of ore to 1 of concentrates.

In an all-sliming and cyanidation process below the stamps the ratio of concentration ranges from 500 to 1,000 tons of ore to one ton of bullion according to the richness of the stamp discharge.

The complex nature of Cobalt ore has developed two processes of importance which are a distinct departure from the general hydro metallurgical treatment of gold and silver ores.

Early in the history of the camp, Prof. S. F. Kirkpatrick, of Queen's University, undertook some experiments on the cyanidation of Cobalt ore. He found the ore as treated by him fairly amenable to cyanidation, but found that zinc as a precipitant had a great tendency to foul the solution and produce a bullion below the market standard.

He finally tried aluminum as a precipitant. This had been discovered and patented by Moldenhauer, who claimed that not only was it a satisfactory precipitant for silver, but that it re-generated the cyanide in chemical combination with silver.

Moldenhauer used the aluminum in the form of plates, which soon became coated with aluminum hydroxide and the action was seriously retarded and the process was consequently impracticable.

*Paper read at a reception to visiting geologists at Cobalt July 28.

Professor Kirkpatrick substantiated all the claims of Moldenhauer and made the process commercially successful by using aluminum in the form of dust. This aluminum percipitation process has been very successful, as it leaves the solution unimpaired and gives a marketable bullion.

It is now in use in the O'Brien mill, the Deloro smelter and, in a slightly modified form, in the Nipissing mill and the Buffalo high-grade mill.

The other process referred to is the de-sulphurizing process, as worked out by Mr. J. J. Denny, resident metallurgist of the Nipissing mine, and is in operation at the Nipissing low-grade mill.

This mill represents the very latest practice in the cyanidation of silver ores, and is a credit to the Cobalt Camp in general and in particular to Mr. R. B. Watson general manager of the Company, to the metallurgical staff, and to Mr. James Johnston who designed and erected the plant.

The details of this process have not yet been made public and are, therefore, not available, though we trust they will be in the near future.

This can be said, that by this process refractory silver compounds such as sulph-antimonides, which are with great difficulty dissolved by the ordinary cyanide process are broken up and desulphurized and rendered readily soluble. This process not only increases the extraction, but shortens the time of treatment.

The importance of this discovery may be realized when it is said that the process is equally applicable to the cyaniding of refractory gold ores.

The process, therefore, marks a distinct advance in the art of hydro metallurgy and will undoubtedly be generally used in the treatment of refractory gold and silver ores.

In conclusion, I might say that I have not attempted to touch on the relative efficiencies of the different mills, as this is a very delicate question and is as complex to the mill man as the origin of ore deposits is to the geologist.

# THE INFLUENCE OF DEPTH ON THE CHARACTER OF METALLIFEROUS DEPOSITS

By J. F. Kemp.

Modern improvements in the art of mining have made possible the sinking of shafts to greater depths. The copper mines on Keweenaw Point, Lake Superior, have several which exceed 5,000 feet and a larger number between 3,000 and 4,000 feet. The deepest of these shafts attains the lowest point beneath the earth's surface yet reached by man himself, but as is generally known, the drill, although not in search of metals, has gone 1,500 or more feet deeper. We are thus learning by actual observations the mineralogical conditions at increasing depths and also the effect of depth upon values.

The questions thus raised have three sides, all of much interest. On the one side is the actual engineering problem of deep mining. Assuming that ore maintains values such as we customarily obtain to-day, we may raise the question, how deep is it feasible to sink for its extraction? Hoisting cables, when used in single lifts, have a limit beyond which their own weight makes them impracticable. Hoisting must therefore be performed in several steps, and power must be transmitted to some sort of engines at successive depths. Rock pressure upon excavations becomes very great, making the support of roof and walls increasingly serious. Water can, however, almost always be impounded in upper levels, so that pumping need not be a drawback, but in regions of recent vulcanism, such as the Comstock Lode, it may be an important factor in depth. Happily, well-nigh universal experience shows that water is practically limited to the upper one or two thousand feet of the earth's crust. Increasing temperature is, however, a great handicap on the miner. If, as in the deep mines of Keweenaw Point, men must work in confined drifts and stopes at the temperature of a hot summer day, only the exhaust of compressed air from the drills makes conditions favourable for effective labour. Some years ago, Dr. Alfred C. Lane, at the time State Geologist of Michigan, the state which contains the very deep mines, discussed the question, "How deep can we mine?" and reached the conclusion that 10,000 feet was the practical limit. Were, however, unusually rich ore to be had, a somewhat greater depth might be reached.

On another side the whole problem is affected by what we have learned with regard to the values of ore with increasing depth. Recorded experience is multiplying, and at least two observers have summarized worldwide results in mining. To this topic we will return in a moment, after stating the third point of view, which is the purely scientific one of the effect of increasing depth upon those geological conditions which influence the percipitation of ores. In casting light upon this phase of the matter we have the results of some artificial experiments in producing minerals and in the behaviour of rocks under pressure which are of decided interest.

It is also important, in the preliminary way, to bear in mind the metal or metals in whose search our deepest shafts have been sunk, and to comment on the types of ore-body which they have developed. In the citations below a general summary of the deepest is given and to this one or two others may here be added. Copper in the native condition is the object of deep mining on Keweenaw Point and is a very unusual form of this metal. We would normally expect sulphides. The ore-bodies now sought are not in veins or deposits which fill old fault lines or crushed zones and their attendant waterways, but are impregnations of conglomerates and amygdaloids. There are, indeed, a few old mines based upon fault fissures, but they have never been followed to depths beyond the ordinary. The precipitation of this vast quantity of a native metal which is found in the usual course of mining only in the gossan, presents an exceptional problem. The native copper has been followed nearly or quite a vertical mile below the level of the ground-water and obvi-

A paper read at Toronto Session, International Geological Congress, August, 1913.

ously cannot be due to descending surface waters when the enclosing rock had any such attitude with regard to the surface as at present. These deep mines do not throw much light on the circumstances attending the ordinary precipitation of sulphides.

The other very deep mines, say, below 4,000 feet. are not many and have chiefly been sunk for gold. Two shafts developed saddle reefs in Victoria, and one, doubtless soon to be the deepest of all, follows a vein at Morro Velho, in the State of Minas Geraes, Brazil. The deep shafts in Kolar district, India, seek gold-quartz. The deep shafts in the Transvaal have likewise been sunk for gold, but, of course, not upon ordinary fissure veins. The famous Adalbert shaft at Przibram sought silver and attendant base metals down to 3,600 feet. On the Comstock Lode silver and gold were the objects, and the deepest shaft was 3,350 feet. Copper, with attendant silver, has already been followed to 3,000 feet at Butte, Montana, in sulphides and sulpharsenides. Silver-bearing galena in brecciated quartzites has been developed to 2,500 feet below the crest of the overlying ridge at Wardner, Idaho. Tin in cassiterite has been obtained at still greater depths in Cornwall. Yet in summary we must admit that the very deepest shafts of to-day have had native copper or gold-quartz as their objectives, and the deepest experience which is now available relates to these two metals. We do know, however, aside from such pyrite as may occur with native gold, of sulphide ores, from 2,500 to 3,600 feet below the present surface. In time additional data will undoubtedly be gained regarding others.

Returning to the second point enunciated above, there is no doubt that, in most cases, values in ores decrease in depth after a moderate section of the vertical extent of the vein has been passed. This experience is not universal but it is the rule. The subject is generally discussed in our larger text books on ore deposits, and to these and to several older papers, two important ones have been added in the last two years by engineers of wide experience. If, therefore, the yield of veins or other forms of ore-bodies is considered at the extreme depths now reached in mining, say, 3,000 to 5,000 feet, we must realize that general experience points to lessening values, and the commercial probabilities are discouraging for any new and unexplored property. The experience thus far gained, as noted above, chiefly relates to copper and the precious metals, and to gold much more than to silver.

Several considerations are, however, of interest. In all ore-bodies involving sulphides of copper; to a large degree in those containing gold in association with pyrite; and to an important degree in those involving sulphides of lead and zinc, the three zones in vertical order from above downward, viz., the oxidized zone, the zone of enrichment and the zone of sulphides, must be considered. They have led to important changes in the distribution of values. Even gold itself, when associated with pyrite and manganese, and not in the presence of calcite or dolomite, undergoes secondary enrichment, as W. H. Emmons has recently and acutely shown.

The oxidized zone does not extend below the permanent ground-water level. It is of no importance in connection with the questions before us, except in very arid regions, where the ground-water lies unusually deep. Even then, however, the depths are not such as we are at present considering.

The extent of enrichment in depth is a matter of greater interest. It primarily depends upon the vertical depth to which we are prepared to admit that descending, acidified, metal-bearing solutions, produced by the leaching of the oxidized zone by meteoric waters, may slowly diffuse themselves in the standing ground-water. Obviously, the chief reactions will take place near the ground-water level. We cannot reasonably expect the influence to extend very far. The production of oxidized and enriched ores of zinc is practically limited to a few feet above and below the water level. Lead is very intractable and its enrichment is practically a matter of oxidization and removal of other and more soluble associates above the water level. The behaviour of silver is a matter on which we need light and on which there is a difference of opinion among engineers. Some have regarded the argentite of Mexican silver mines as the result of secondary enrichment and have inferred its disappearance at comparatively moderate depths. On the other hand, in the microscopic study of at least one suite of ores, from the State of Guerrero,—in the endeavour to decide this point, since it affected exploration below a fault,—the writer could find no evidence that the argentite was not one of the original vein minerals. Explorations subsequently undertaken seemed to justify this conclusion, as the vein, with ores unchanged, was found below the fault. Depths of 700-800 feet were involved. Silver becomes so readily locked up as the relatively insoluble chloride, ceragyrite, through the precipitating influence of ordinary surface waters, that it is not so favourable a metal for secondary enrichment as are several others. Gold, though at first sight a comparatively insoluble metal, does yield to the solutions afforded by oxidizing pyrite, in the presence of manganese, as was mentioned above. To what depth, however, the slow diffusion of descending solutions would bring the enriching effects below the water level is a question. Probably the range would not be great and the presumption is strong that the native gold found rarely in large nuggets at great depths in quartz veins is an original precipitate in the vein filling. For great depths, such as those in the Bendigo saddle reefs, it is impossible to refer decreasing yields to waning secondary enrichment.

Copper is the metal of pre-eminent importance in matters of secondary enrichment. Reported falling off in values as greater depths have been attained, has made the influence of this process of special importance. The appreciable decrease in copper percentages which were widely published fifteen years or so ago, regarding the Rio Tinto mines, called attention to it even at this early date. That enrichment may take place for several hundred feet below the permanent water level seems fairly well established both by the experience gained from the disseminated copper deposits ("porphyry coppers") of recent development, and by that gained in our deeper copper mines. In the disseminated copper mines experience shows that, from a condition of maximum enrichment, percentages gradually decline until, within a very moderate vertical range of a few hundred feet, we reach the original lean, copper-bearing and unchanged pyrite. In the great mines at Butte, of which we have descriptions from W. H. Weed, and more recently from R. H. Sales, the latter shows that the demonstrable, secondary chalcocite only extends a short distance below the water level, say two or three hundred feet, although the distance of the water level from the surface is remarkably variable in the different mines. So far as the original vein-filling is concerned, there seems to be no identifiable mineralogical difference in vertical range, so far as we have yet gone, down to 3,000 feet. There is, however, a marked change as we radiate horizontally outward from a central area of copper minerals with no manganese and little or no zincblende, through a zone with decreasing copper and increasing zinc and manganese, to a zone with little or no copper and with silver in association with zincblende, a little galena and great quantities of rhodonite and rhodochrosite.

If, therefore, when we consider behaviour with depth, we focus attention upon the same minerals, at the most, lessening in quantity, or much the same minerals with lessening content of the precious metals,—in mass a very small part of the veins,—we would naturally seek the influence of physical conditions to account for less abundant or less profitable ore.

One other consideration should be first mentioned before briefly referring to the physical conditions. Vein formation in our workable deposits has usually taken place from one to several geological periods ago. Erosion has been active since and has removed an appreciable section of the rocks which existed when the deposition took place. In very ancient veins, such as appear in pre-Cambrian strata, the lost section may be important. Mr. Garrison has laid especial stress upon this phase of the subject, and has remarked Mr. Lindgren's inference that the lowest explored Bendigo saddle reef had formed when at least 7,000 feet from the surface; that the ores of the Mother Lode, California, had been precipitated at 6,000 feet; that the gold-bearing veins of the southern Appalachians must have been deposited over a vertical range of 7,000 to 8,000 feet; and the conclusion of Mr. F. L. Ransome that erosion has removed 2,000 to 5,000 feet of rock from Cripple Creek, Colorado. We may add that Dr. S. F. Emmons stated his belief, in his famous monograph on Leadville, Colorado, that the ores had been precipitated when 10,000 feet below the surface. Many other cases could be easily cited, but these will suffice to make clear that even the ores which we mine to-day, and which have been unaffected by secondary enrichment, were originally precipitated at much greater depths than the present workings. The physical conditions involved in vertical depth, down to 6,000 to 10,000 feet, would not seem to be of themselves prohibitive of the precipitation of commercial ore.

Still another feature of veins is the distribution of ore in shoots, with barren stretches between. Shoots succeed one another both in vertical and in horizontal distribution. Exploration is much more expensive at great depths than nearer the surface, and under these circumstances operators may much more easily become discouraged in the search for new veins when old ones become exhausted. We can hardly say that ore does not persist, even though it may not be commercially profitable to sink or drift for it.

The matter of possible cavities deserves a word of comment. While, as has been so ably shown by the honoured President of this Congress, Dr. Frank D. Adams, cavities are still possible at depths of 10 or 12 miles, yet large open spaces such as would form a resting place for ores, aside from replacement, would be naturally best developed within moderate distances from the surface. Mr. Rickard has commented upon this feature of the subject, and doubtless it is one of the serious factors influencing the final result.

As time passes, students of these phenomena seem to be increasingly convinced that the veins, such as would be considered in connection with profound depths, have been filled by uprising heated solutions. Since high temperatures generally favour solution and heavy pressures cannot be without their influence as well, decreasing temperatures promote precipitation with increasing efficiency as the surface is approached. Undoubtedly in these influences we have an explanation deserving confidence. There may well be a vertical range, wherein precipitating influences are at their best—one which corresponds with the section marked by our profitable ore bodies in the mines. The slow erosion of the tops of veins, with the attendant sinking of the groundwater level, serves further to enhance values by the processes of enrichment. Ore bodies of metals, other than iron, which have been precipitated at or immediately below the surface by uprising heated waters are extremely rare. Sulphur Bank, California, and Steamboat Springs, near Virginia City, Nevada, with their relatively small yields of quicksilver, are almost the only ones which suggest themselves. Mr. Lindgren has also remarked that ore bodies in purely surface flows of eruptive rocks are relatively rare. Ore bodies are much commoner in association with intrusive rocks or with others which have been deeply buried.

We are now pretty well assured both from the study of mineral springs and from the artificial production of some of the minerals common in ores, that the uprising solutions are alkaline in character. Only in the descending meteoric waters which leach the outcrops, do we find acid solutions. The deep-seated waters are carbonated and often charged with hydrogen sulphide. The descending waters are oxygenated. The most common and widespread sulphide in veins in general, is pyrite, and it has special claims to interest because of its parallel mineral, marcasite. Messrs. Allen, Crenshaw and Johnston of the Carnegie Geological Laboratory in Washington have recently made some experiments in the production of these two which are of extreme interest. On page 171 of their paper is the following passage: "The pyrite of deep veins, metamorphic contacts and hot-springs, as well as magmas, has been formed by hot solutions, and such solutions never contain strong mineral acids, but are generally, if not always, alkaline. The pyrite and marcasite of surface veins, on the other hand, are formed from cold solutions, which often contain considerable sulphuric acid." In their experimental production of pyrite, hydrogen sulphide was the quite invariable precipitant; the reduction of sulphates seems to be an assumption, not corroborated by experiment. With the reagents employed, pyrite formed very slowly at room temperatures, but much more rapidly at 200 degrees C. On p. 192 the following passage appears: "Pyrite, being a stable form, probably crystallizes under a considerably wider range of conditions than marcasite. The evidence of synthetic study is that the formation of pyrite is favoured by high temperatures and by solutions which contain little or no free acid. In accord with these we have the following geological deductions. First, pyrite is the product of hot-springs. In the springs of Carlsbad, which have a temperature of 55 degrees C, recent pyrite is observed. The waters contain sulphates and a trace of hydrogen sulphide and are slightly alkaline. The lagoons of Tuscany are depositing pyrite from their hot waters. Bunsen found that the hot vapours of the fumaroles of Iceland were gradually changing the ferrous silicate of the basalts into pyrite. More important geologically is the fact that the product of deep veins by ascending waters is always pyrite, never marcasite. Such waters are naturally hot, and commonly, if not always, alkaline. We can now see that the separation of pyrite from a magma is entirely possible, while the temperature of any magma would doubtless be incompatible with the existence of marcasite."

As bearing on the problem of the continuation of ore in depth we can only conclude from the experiments and observations of Messrs. Allen, Crenshaw and Johnston that pyrite can precipitate at a depth fully as great as any shaft yet sunk.

Very similar conclusions have been established by Messrs. Crenshaw and Allen for the two sets of parallel minerals sphalerite and wurtzite and cinnabar and metacinnabar. On p. 396 of the citation they summarize their conclusions as follows: "Comparing the genetic relations of the minerals sphalerite and wurtzite, cinnabar and metacinnabar, with the genetic relations of pyrite and marcasite, we find certain remarkable regularities. The stable forms, sphalerites, cinnabar and pyrite, are always obtained by crystallization from alkaline solutions (solutions of the alkali sulphides), while the unstable forms, wurtzite, metacinnabar and marcasite, are obtained from acid solutions only. The stable forms may also be crystallized from acid under certain conditions. Of these, temperature and acid concentration seem to be the important ones.

Certainly with pyrite and marcasite, and in all probability with sphalerite and wurtzite, the higher the temperature the greater the percentage of the stable form obtained, while the higher the acid concentration at any temperature, the greater is the percentage of the unstable form obtained. These facts appear to agree remarkably well with the field evidence, which relates to the genesis of the natural minerals, while they give new significance to the general geologic distinction between deep-seated and surface waters in nature."

The experiments of these investigators clear up for us the fundamental chemical differences between the processes of primary precipitation and of secondary enrichment, but as regards the continuation of ore in depth, we can only say:

1. While there seems to be nothing to prevent precipitation at greater depths than we have yet reached, yet conditions seem to be specially favourable in those portions which lie between the present surface and 2,000 to 4,000 feet in depth.

2. Secondary enrichment has increased the yield of those portions of many veins which are above 1,000 feet in depth, the vertical extent of its action being limited to a relatively short stretch below the groundwater level.

# THE COBALT AREA*

By WILLET G. MILLER.

In 1903, during the construction of the Timiskaming and Northern Ontario Railway, which is owned and operated by the Ontario Government, rich veins of cobalt-silver ore were discovered near what is now known as Cobalt Station. The railway track runs almost over the top of one of the most important veins yet found.

At the time the discovery was made, the veins attracted little attention, the discoverers not being men whose vocation was that of prospecting or mining.

Niccolite is a characteristic mineral of the area, and, as its German name, kupfer-nickel, indicates, its colour is somewhat like that of copper. Hence, it is not surprising that some of the first persons to see the deposits mistook the niccolite for copper ore, and, not having their attention drawn to the native silver, which occurred in profusion in parts of the veins, should have decided that the deposits were of the less precious metal. A sample of the niccolite, received at the Bureau of Mines towards the end of October of the year mentioned, aroused the writer's interest, and he decided to visit the locality from which it came.

The great Sudbury nickle area lies 90 miles to the southwest of Cobalt, and in a report on a trip of exploration to the vicinity of what is now Cobalt, in 1901, the writer had said:

"It will be seen from what has been stated on preceding pages that the district examined contains as great a variety of rocks as probably any other part of the province of equal area. . . .

"Although few discoveries of economic minerals have been made in this territory, it may reasonably be expected, judging from the character and the variety of the rocks, that deposits of value will be found when the district is more carefully prospected, as it will be in a short time, owing to the rapid settlement which is now taking place. . . . It would seem that at least some of the conditions of the Sudbury district are repeated in this more eastern field."*

Naturally, on the receipt of the sample of niccolite, it appeared that this prediction might have been verified, and that deposits of nickel vastly richer than those of Sudbury might have been discovered.

On examining the veins then discovered, four in number, all near the shore of Cobalt Lake, an unexpected and astonishing assemblage of minerals was seen, the most prominent being native silver, niccolite, smaltite and cobalt bloom. In the first paper he published on the area, describing one of the veins, the writer said:

"Here a perpendicular bare cliff, 60 or 70 feet high, faces west. The vein. . . . cuts this face at right angles, having an almost vertical dip. . . When I saw it first it had not been disturbed. Thin leaves of silver up to two inches in diameter were lying on the ledges and the decomposed vein matter was cemented together by the metal, like fungus in rotten wood. It was a vein such as one reads of in text-books, but which is rarely seen, being so clearly defined and so rich in contents."*

The veins are narrow, averaging not more than four inches (10 cm.) in width. This feature discouraged certain of the first mining engineers who examined the outcrops, and caused them to doubt whether the veins were of economic importance. However, the large number of veins and their great richness has more than compensated for their narrowness.

It was soon proved by comparatively little work that Cobalt was really a "poor man's camp." One of the first operators, for instance, extracted ore having a value of approximately $250,000 at a total cost of $2,500. Statistics show that during the period of mining in the

*Extracts from Guide Book No. 7, published by Geological Survey of Canada for the Twelfth International Geological Congress.
*11th Report, Ontario Bureau of Mines, p. 229.

area dividends distributed have been equal to over fifty per cent. of the value of the output.

In the earlier years of mining there were no refining plants, in North America at least, that could economically treat the ores. Owing to the unusual and complex character of the ores there was waste of other constituents in extracting silver, there being present in addition to the precious metal, arsenic, cobalt and nickel in important quantities.

The Cobalt area is not unique in Ontario in possessing an unusual ore, other representative economic minerals of the province when discovered being without a market or requiring the development of a refining process. The Sudbury deposits, for example, were opened up for copper, nickel being afterward found to be present. A considerable period elapsed before refineries were developed and a market made for the nickel by proving to the nations of the world its value as a constituent of steel for armour plate. Again, in the earlier years of apatite mining in Ontario, the amber mica, which is now so highly prized, associated with this mineral, was thrown on the waste heaps. And when the corundum deposits were discovered, a process had to be developed for milling the rock and a market had to be made for the material. Other instances could be cited, but the examples given show that the characteristic of the minerals mined in Ontario's pre-Cambrian rocks is uniqueness.

It is gratifying to know that within the comparatively few years that mining has been prosecuted at Cobalt, plants capable of refining all of the constituents of the ore have been erected in Ontario, the processes employed being either improvements on those in use elsewhere or invented especially for these ores, such as that employed at the Nipissing mine for the extraction and refining of silver. This metal is refined at several other plants, and white arsenic and cobalt and nickel oxides are produced. The plants for refining cobalt oxide in Ontario are of capacity sufficient to supply the world's demand for the material. The white arsenic produced from Cobalt ores represents about 20 per cent. of the world's output. Cobalt is the world's greatest producer of silver, its output representing about 13 per cent. of the whole.

In 1904, the year in which the first shipments were made, there were produced 158 tons of ore. The average percentages of the four metals in this ore were:

Silver. . . . . . . 5.34 per cent., or 1,309.33 ounces per ton.
Cobalt . . . . . . . 10.21 " "
Nickel . . . . . . . 8.86 " "
Arsenic . . . . . . 45.56 " "

In 1905, there were shipped 2,144 tons of ore of the following composition:

Silver. . . . . . . 3.90 per cent., or 1,138.72 ounces per ton.
Cobalt . . . . . . . 5.50 " "
Nickel . . . . . . . 3.49 " "
Arsenic . . . . . . 25.60 " "

The ore shipped till near the end of 1907 was sorted by hand, or with crude mechanical appliances. Since then extensive concentrating plants have been erected.

**Production of Cobalt Mines, 1904—1912.**

The following table summarizes the production of the Cobalt and adjacent areas:—

| Year. | Ore shipped. Tons. | Nickel. Tons. | Nickel. Value. $ | Cobalt. Tons. | Cobalt. Value. $ | Arsenic. Tons. | Arsenic. Value. $ | Silver. Ounces. | Silver. Value. $ | Total Value. $ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1904.... | 158 | 14 | 3,467 | 16 | 19.960 | 72 | 903 | 206,875 | 111,887 | 136.217 |
| 1905.... | 2.144 | 75 | 10,000 | 118 | 100.000 | 549 | 2,693 | 2.451.356 | 1,360.503 | 1.473,196 |
| 1906.... | 5,335 | 160 | ...... | 321 | 80.704 | 1.440 | 15,858 | 5,401,766 | 3.667.551 | 3,764,113 |
| 1907.... | 14.788 | 370 | 1,174 | 739 | 104.426 | 2.958 | 40,104 | 10,023,311 | 6.155,391 | 6.301,095 |
| 1908.... | 25,624 | 612 | ...... | 1.224 | 111.118 | 3.672 | 40,373 | 19,437,875 | 9,133,378 | 9.284,869 |
| 1909.... | 30,677 | 766 | ...... | 1.533 | 94.965 | 4.294 | 61.039 | 25,897,825 | 12.461,576 | 12,617,580 |
| 1910.... | 34,282 | 504 | ...... | 1,098 | 54,699 | 4.897 | 70.709 | 30,645.181 | 15.478,047 | 15.603,455 |
| 1911.... | 26,653 | 392 | ...... | 852 | 170,890 | 3.806 | 74,609 | 31,507,791 | 15,953,847 | 16,199,346 |
| 1912.... | *21,933 | ...... | ...... | †515 | 317.165 | ‡1.964 | 79,297 | 30,243,859 | 17.408,935 | 17,805,397 |
| Total.. | ...... | ...... | ...... | ...... | ......... | ...... | ...... | 155,815,839 | 81,731,115 | 83.184,268 |

*Does not include ore refined at Cobalt.

For some time after mining began at Cobalt, the ore was shipped to the sampling works of Ledoux and Company, New York. The richest shipment contained 7.402 ounces of silver to the ton, the next in order being 6,909; 6,413; 6.163 and 5.948 ounces to the ton. The average percentages of other metals in the 366 carload lots sampled by this firm were: cobalt, 5.99; nickel, 3.66; arsenic, 27.12.

Concerning the high-grade ore at Cobalt, Mr. R. B. Watson recently has said: "A typical ore carries 10 per cent. silver, 9 per cent. cobalt, 6 per cent. nickel, and 39 per cent. arsenic; the rest is lime, silica and smaller amounts of antimony, iron, sulphur, tellurium, etc.*"

The most productive vein in the area is that known as the Carson, on the Crown Reserve property. It has been estimated that this vein, with its extension on the Kerr Lake property, will have produced before being exhausted 20,000,000 ounces or more of silver from that part of it above the 200-foot level.

The richness of the ore in various mines is well shown by what it has cost, on the average, to produce an ounce of silver. In 1911, for example, the cost per ounce, including mining and all other expenses, given in the annual reports of certain companies, was: at the Crown Reserve, 10.761 cents per ounce; at the Coniagas, 8.8; at the Nipissing, 13.95, and at the Kerr Lake, 14.69.

The chief object in building the Timiskaming and Northern Ontario Railway was the development of the agricultural areas at the head of Lake Timiskaming, to the north of Cobalt. It was also felt that the railway would increase the value of the timber lands through which it passed, but, it is safe to say, the most sanguine supporters of the policy of railway building little dreamed of the mining development to which the construction of the road would lead. It is true that mining at Sudbury had been pursued for some years before it was decided to build the railway into the Timiskaming country, but Sudbury had never excited much interest among the people of Ontario. Those who were inclined to invest in mines had little faith in the mineral resources of their own province. The discovery of Cobalt,

Eng. and Min. Jr., Dec. 10th, 1903.
†Cobalt oxide, etc. ‡Refined.
*Eng. and Min. Jr., Dec. 7th, 1912.

however, has given confidence in the province's mineral industry and has led to the development of Porcupine and other areas tributary to the railway. The value of the ore produced at Cobalt, in less than ten years, is equal to about five times the cost of constructing and equipping the 252 miles of railway from North Bay to Cochrane, together with branch lines, and the dividends alone are equal to two and a half times the total cost of the railway.

Moreover, the discovery of Cobalt, which lies near the southern edge of the great pre-Cambrian regions that occupy nearly one-half the surface of Canada's 3,750,000 square miles of territory, has given confidence in these regions as storehouses of economic minerals and ores that future prospecting will bring to light.

### The Rocks and Their Relationships.

At first, owing to the surface being covered with green timber and to the presence of much drift material, contacts and good exposures were difficult to find. Now, that the timber has been removed parts of the area have almost the appearance of a large model, e.g., between the northwestern face of Mount Diabase and Peterson and Cart lakes, or on the Nipissing property to the west of Peterson lake, where the loose deposits have been removed from the surface by hydraulicking.

From the maps of the area that have been published, it will be seen that there is considerable variety in the pre-Cambrian series. On the shores and islands of Lake Timiskaming, a few miles to the north or northeast of Cobalt Station, the Clinton and Niagara of the Silurian system also show prominent outcrops. Between the Niagara and the Pleistocene or Glacial there are no formations represented in the district.

The following table shows the subdivisions, based on age relations, that have been made among the rocks of the Cobalt area proper. Representatives of most of these subdivisions of the pre-Cambrian are found in other areas that have been carefully mapped in the surrounding region.

In the Porcupine gold area, one hundred miles to the northwest of Cobalt, the Keewatin and Timiskaming series are prominent. The Cobalt series is also present in this area, and certain dikes are believed to represent the Nipissing diabase of Cobalt.

In the Gowganda silver-cobalt area, which lies fifty or sixty miles to the west of Cobalt, the Nipissing diabase and Cobalt series occupy much of the surface. The Timiskaming series is found in good exposures in part of the area. The latter series has also been found at Swastika and Larder lake, at Abitibi lake, 75 miles north of Cobalt, and eastward across the boundary in Quebec. It is thus known to occur at various points over a large region.

It is possible that unconformities that have not been discovered exist in the pre-Cambrian of the Cobalt and adjacent areas. Moreover, the relationship which the Cobalt and Timiskaming series have to the fragmental rocks of the classic Huronian area of the north shore of Lake Huron is not known. Hence, in the following table the name Huronian is not employed. If the Huronian is considered to include all the post-Laurentian and pre-Keweenawan fragmental rocks of the region, then both the Cobalt and Timiskaming series come under this heading.

The dual subdivision of the pre-Cambrian into Algonkian and Archean, or Proterozoic and Archeozoic, employed by many authors, is not adopted by the writer, since he believes that the Grenville series, which includes limestones and other sediments of great thickness, is of pre-Laurentian age. Thus a dual subdivision of pre-Cambrian rocks, based on arguments that have been employed in its behalf, fails. If a name is desired for the pre-Cambrian rocks, to correspond with Paleozoic and Mesozoic, the well-known name Eozoic may be used.

### Age Relations of Rocks of Cobalt and Adjacent Areas.

**Palezoic (Silurian, Niagara).**—Prominent outcrops of Niagara limestone, with basal conglomerate and sandstone, occur on some of the islands and the shores of the north end of Lake Timiskaming. (Great unconformity.)

**Eozoic or Pre-Cambrian (Later Dikes).**—Aplite, diabase, basalt.

**Nipissing Diabase (Intrusive Contact).**—This diabase, which is of such great interest in connection with the cobalt-silver veins, is believed to be of Keweenawan age. Certain aplite dikes are genetically connected with the diabase.

**Cobalt Series (Unconformity).**—The Cobalt series includes conglomerate, greywacke and other fragmental rocks.

**Lorrain Granite (Intrusive Contact).**—This granite occupies a considerable part of the Township of Lorrain and has large exposures elsewhere in the vicinity of Lake Timiskaming.

**Lamprophyre Dikes (Intrusive Contact).**—Lamprophyre dikes are to be seen near some of the mines at Cobalt.

**Timiskaming Series (Unconformity).**—Like the Cobalt series, the Timiskaming consists of conglomerate and other fragmental rocks.

**Keewatin Complex.**—The Laurentian, gneiss and granite, which in age lies between the Keewatin and Timiskaming, is absent in the Cobalt area proper, but is found in the surrounding region.

Under the heading Keewatin are grouped the most ancient rocks of the region. They consist essentially of basic volcanic types, now represented by schists and greenstones, together with more acidic types, such as quartz-porphyry.

With the Keewatin are included certain sediments, such as iron formation or jaspilyte, dark slates and greywackes, which probably represent the Grenville series of southeastern Ontario.

Certain dike rocks that are grouped with the Keewatin may be of post-Timiskaming age, but since they have not been found in contact with the Timiskaming series their age relationships are unknown.

(To be Continued.)

# ON THE ORIGIN OF THE PORCUPINE GOLD DEPOSITS*

By Reginald E. Hore.

Gold occurs at Porcupine in quartz bodies of very numerous forms. Many of the deposits may be classed as one of four types*:—1, quartz veins; 2, quartz vein systems; 3, quartz masses; 4, quartz-ferrodolomite lodes. The quartz veins are well defined, single fissure fillings, commonly varying considerably in thickness and forming numerous lenticular portions, but having on the whole a somewhat tabular form. The vein systems are made up of two or more veins, close together and more or less parallel. The quartz-ferrodolomite lodes

*A paper presented at the Annual Meeting, Canadian Mining Institute, Toronto, 1912.

*Illustrations of these types were given in Canadian Mining Journal, November 1, 1910, pp. 649-656. Descriptions of a number of the deposits are given by A. G. Burrows, in his report on "The Porcupine Gold Area," pp. 20-31, 20th Annual Report, 1911, Bureau of Mines.

are made up of ferrodolomite traversed by numerous veins and veinlets of quartz. The quartz masses are of irregular and for the most part of unknown shape. Some have been described† as kidneys and chimneys. Others show a tendency to elongation in two directions and appear to be members of a series of thick lenticular masses lying at intervals along a fissured zone.

The rocks enclosing ore are of several different types. A common one is a gray sericite-carbonate-quartz schist that was probably originally a quartz porphyry. Other wall rocks include basalt, porphyrite, conglomerate and gray slate.

It appears that neither the form of the opening or the character of the country rock were the chief factors in the formation of the ore bodies. These are important factors to be considered in the study of the individual ore shoots; but will not enter into the present discussion. Attention is here directed rather to characters common to all. These characters indicate a common origin and by their nature give some clue to the process involved in the formation of the deposits.

Characters of the Gold Ore Determined Optically.—The ore in all cases is native gold* in pyritic quartz. The gold is partly in coarse grains, visible to the naked eye, but is chiefly in very minute particles, intimately associated with pyrite. Some of the gold is actually intergrown with pyrite; but most of it is not. Some of the gold intergrown with pyrite is in very small grains, visible only with the aid of a microscope, and it is quite probable that there are similar particles which are not visible on account of their smaller size. Some gold is in calcite or ferrodolomite. Galena, sphalerite and chalcopyrite occur frequently, but in small quantity. Tourmaline, feldspar‡, scheelite and some yet unidentified minerals also occur.

The pyrite associated with native gold is in some cases in large, well-formed crystals; but most of it is in small and, for pyrite, very poorly-formed crystals.

The gold and pyrite are not distributed uniformly through the quartz and are commonly most abundant near the wall rock or pieces of rock enclosed in the quartz. Large areas of vein material are quite free of opaque minerals.

The quartz in some cases has a ribboned appearance due to the presence of dark coloured aggregates of minerals in minute crevices. The aggregates are made up chiefly of pyrite, sericite, carbonates, chlorite and a brown serpentinous substance of unknown composition. The same minerals also occur irregularly through white quartz giving some of the ore a spotted appearance. From the mode of occurrence of these dark coloured aggregates it seems likely that they were formed after the quartz had been crushed. From the occurrence of gold with these aggregates it seems likely that some of the metal has been deposited much later than the quartz.

The quartz is made up partly of large grains, which probably represent the form in which it was originally deposited; but largely of very small grains, which have evidently been formed by subsequent crushing or granulation. The individual grains in almost all cases when examined in polarized light exhibit evidence of strains. In the specimens examined microscopically, most of the gold is in parts of the quartz which have been granulated.

The quartz contains very numerous fluid inclusions, and was therefore probably deposited from a hot solution at considerable depth. Such inclusions are very common in quartz which is known to have been deposited hot, as in the case of the formation of such rocks as granite. The mere presence of inclusions is not of itself sufficient evidence of high temperature and depth, for there is reason to believe that some inclusions have been formed after the solidification of the quartz. The inclusions are frequently arranged in rows, and some of these run through adjacent quartz grains without interruption. Many of the rows, however, terminate at the quartz grain boundary, and there appear to be fewer inclusions in the granulated than in the original quartz grains.

There are other characters which suggest that the solutions were hot and probably partly of magmatic origin. Pyrite is commonly formed from hot alkaline solutions. Tourmaline is frequently and scheelite occasionally present, and these two minerals are generally found in what are believed to be acid differentiation products. Sericite, so abundant in the wall rocks, is a mineral that is generally thought to be formed by hot solutions.

From optical examination it seems likely that the gold, pyrite and quartz were originally deposited from the same solution and that the solution was hot. Subsequently the deposits were crushed and fractured and secondary minerals were deposited in the fractures. It is probable that some of the gold was dissolved and re-deposited in other parts of the vein. It appears especially probable that the coarse grains were formed by such a secondary process.

Some writers have interpreted their observations to indicate that the fissures were first filled with barren quartz and that the gold was introduced later. It is of course possible that such was the case; but I can find no necessity for such an assumption and hence prefer the simpler hypothesis. The constant occurrence of quartz and pyrite with the gold and the paucity of gold in those enclosing rocks in which quartz and pyrite are not abundant, seems sufficient evidence for the assumption of a common origin for the three minerals. Gold, quartz and pyrite were probably deposited together, and, so far as I am aware, there is a lack of evidence that gold-bearing quartz has been introduced after the first filling of the fissures. Subsequent solution and redeposition of some of the constituents of the primary filling and of the country rocks would account for the phenomena observed.

**Characters of the Gold Ore Determined by Assays.**—Assays have shown that the gold is not regularly distributed through the quartz, but, as is commonly the case, it is chiefly in parts referred to as ore shoots. The ore is fairly high grade; but owing to the difficulty in distinguishing it from waste or mining it separately when distinction is possible, it is not improbable that the run of mine ore in some cases will be more properly referred to as low-grade. In the high-grade ore shoots the values have been found to be very irregularly distributed.

The gold is chiefly confined to the quartz veins or masses. The country rock in some cases contains pay values, but so far as I can learn there has not yet been found any important body of ore in rock that is not penetrated with quartz. The constant association of gold and quartz indicates clearly a common origin.

Assays show that the gold is chiefly in parts of the quartz near wall rock or pieces of enclosed rock, and especially in parts of the quartz that have been crushed. Most of the gold occurs with pyrite and non-pyritic quartz in the same deposit is commonly barren.

At the Hollinger it has been found that the occurrence of visible gold does not necessarily mean payable values, and that quartz streaked with fine lines of

†P. A. Robbins, Annual Report Hollinger Mine, Jan. 1, 1912, p 6.

*It is not unlikely that some tellurides of gold occur; but, so far as I can learn, none have been found. Mr. Robt. Harvie has found tellurides in similar deposits at Opasatica Lake, Quebec, which he described in a paper in vol. xiv., pp. 164-170.

‡C. W. Knight describes in Notes on Bureau of Mines Map, veins on Miller Middleton claims, having the composition of granite. See also A. G. Burrows' report, p. 19, 1911. J. Stansfield describes occurrence of feldspar in ore from Vipond Mine.

pyrite in the cleavage is generally more consistant in gold values than the clear masses carrying occasional spectacular showings. Mr. Robbins found the main vein to present an unbroken ore shoot for over 1,000 feet horizontally, to be 2 ft. to 20 ft. wide, and to be usually richer in the wide portions. The occurrence of galena was found to portend rich gold values and to a lesser degree the occurrence of sphalerite proved to indicate gold values. Large, blocky crystals of pyrite are usually attended by low values in gold, while finely crystalline pyrite occurs with relatively higher values.

It seems likely that the spectacular gold has formed by the growth of some gold grains at the expense of others in the immediate vicinity, and consequently much of the quartz near coarse gold is practically barren. The occurrence of gold with the poorly crystallized small grains of pyrite indicates that the deposition of the gold took place under conditions which were very unfavourable for the crystal growth. It is likely that the auriferous pyrite was deposited much more quickly than the non-auriferous pyrite. The different degrees of crystallization may have been due to rapid solidification from a hot solution in one case and slow growth from more gradual cooling or removal of solvents in the other. Evidently the conditions favourable to growth of large pyrite crystals were also favourable for the formation of coarse gold grains. Both are probably the result of redeposition under conditions quite different to those which obtained in the first deposition. The deposition in both cases, however, was probably at depth and from hot alkaline solutions.

The irregular distribution of the fine gold indicates that in the primary deposition there was a tendency for the gold and pyrite to segregate somewhat from the main mass of silica. There is no good reason to suppose that the contemporaneous deposition of gold, pyrite and quartz would result in very uniform distribution of the gold throughout the whole mass of quartz. The most favourable place for deposition of gold was evidently the vicinity of enclosing or enclosed rock.

**Characters of the Gold Ores Determined by Mechanical and Chemical Treatment.**—While all the ores are examined optically, it is done for the most part in a rather cursory manner, and by those who do not record their observations. The samples examined microscopically are very small and may not be representative. The samples assayed are much more numerous and larger, and we have found that the assays are in a general way such as might be expected from the ores described from optical tests alone. A consideration of the results obtained by milling and cyaniding should show whether the ore thus tested was similar to that examined microscopically and to the samples assayed.

Tests on the ores of the Dome and Hollinger Mines show them to be very free milling. Much of the gold is in clean quartz, from which it is very readily freed by crushing and then readily recovered by amalgamation. The remainder is rather readily recovered by regrinding and amalgamation, followed by cyanide treatment.

The results obtained in testing Dome Mine ore have been published in The Canadian Mining Journal, Feb. 15th, 1911, pp. 126-127. The ore was at first considered to be an ideal concentrating ore. The gold being closely associated with the pyrite, a high-grade concentrate was obtained. The tailings, however, were sufficiently valuable to warrant cyaniding. By regrinding the concentrate, it was found that a large percentage of the gold could be recovered by amalgamation. By grinding to 90 per cent. through a 200-mesh screen, 84 per cent. of the gold was recovered by amalgamation. The ore tested was found particularly free from cyanides, the only difficulty arising from the presence of a small amount of carbonaceous material, which made it necessary to lengthen the period of agitation to avoid a secondary precipitation. Mr. W. C. Merrill, designer of the plant, has recently been quoted as saying that the total recovery is expected to be not less than 95 per cent.

The results obtained in testing Hollinger Mine ore have been published in the first annual report, January, 1912. Tests for extraction were run upon a sample containing 2.1 oz. per ton. This sample was found to contain 4.86 per cent. of concentrates, and the concentrates contained 82.6 per cent. of the gold contents of the ore. (Shows intimate association of gold with pyrite, for very fine gold in clear quartz would not be in concentrate.) Following concentration the residue was leached with cyanide solutions, and after 114 hours' treatment, it was found that cyaniding had extracted approximately 60 per cent. of the remaining values.

In the second test the ore was ground in the mill to pass 120-mesh and split into two lots. The first lot was concentrated, the concentrates removed and the impoverished residue agitated by air in cyanide solution. After 34½ hours' treatment, the extraction by cyaniding of values contained in residues was found to be 95.1 per cent. and the combined extraction by concentration and cyaniding was 99.56 per cent. of the total original gold contents of the sample. The second lot of finely crushed ore was concentrated, but after pan-amalgamation of the concentrates, they were returned to the agitator to be treated with the tailings from the concentrator. The combined extraction by this method was practically 100 per cent., as the residue after 36 hours of cyanide treatment carried only a trace of gold. In these tests the concentrates amounted to approximately 37 per cent. of the total ore treated, and the consumption of cyanide was in the neighbourhood of two pounds per ton. Mr. Robbins states that the net result of the tests on Hollinger Mine ore was to show the necessity for fine grinding and also the advisability of extracting the concentrates for separate treatment.

Results of tests on ore from the Vipond Mine are given by E. M. Flynn in H. P. Davis' Handbook of the Porcupine Gold District, 1911, pp. 38-39. The ore was stamped to pass 20-mesh, passed over amalgamation plates, the pulp from the plates concentrated on Wilfley tables and the tailings separated into sand and slime. The sand was leached for 72 hours with 0.2 per cent. KCN solution. The recovery on the plates was 73.46 per cent., on the tables 14.06 per cent., and by cyanidation of sand tailing 3.20 per cent. Further cyanide tests proved that the extraction could be considerably increased by fine grinding of the sands. It was found that concentrate (25-1) from high-grade ore ($100 to $200 per ton) contains about the same gold as that from lower-grade ore ($20 to $30). The concentrate in each case was rather low-grade ($50 to $150), indicating that comparatively little gold is enclosed in pyrite.

From the intimate association of gold with pyrite, it is evident that on coarse grinding nearly all the microscopically visible gold would be contained in a concentrate comprising a very small part of the ore. Mr. Kirby's test, 82.6 per cent. of the total gold to be in concentrate comprising 4.86 per cent. of the ore.

From the microscopically visible gold enclosed in clear quartz and other light minerals, it is evident that many of the finer particles of gold would not be reached by cyanide solution unless finely ground. Mr. Kirby's test on the residue shows 40 per cent. unrecovered, and his screen test shows 61 per cent. of these values to be in sand coarser than 60-mesh.

Most of the microscopically visible gold associated with pyrite is not completely enclosed in pyrite or even in actual contact with it, and it is evident that if finely ground, it would be very readily amalgamated. All the mill tests show this to be the case.

From microscopic examination it is known that gold occurs in very minute particles, and it seems not unlikely that the invisible gold is present also as the native metal, but in particles of sub-microscopic size. The mill tests show results which would be expected if such very fine particles of native gold were present, and there seems no good reason to assume that the gold in pyrite is other than a mechanical mixture. There is then no evidence of the former existence of the gold in some mineral other than the native metal, and it is safe to conclude that part at least is in the form in which it was originally deposited.

**Characters of the Wall Rocks.**—The wall rocks are of several types, originally quite different, but by secondary changes having in common a high content of sercite, ferrodolomite and quartz. The wall rock of most of the ore bodies is a gray sericite-carbonate-quartz schist that was probably originally a quartz porphyry. Other wall rocks include basalt, porphyrite, conglomerate and gray slate. These are all much altered, and near the veins there is usually much pyrite present. It is commonly in well-formed cubical crystals. As a rule the amount of pyrite in the rocks is much greater than in the veins.

The characters which are common to all the wall rocks are of secondary* origin. It is evident that similar solutions penetrated and altered the different rocks and replaced some of the constituents by sericite, ferrodolomite, calcite, quartz and pyrite.

These minerals are especially abundant in the immediate vicinity of the quartz veins, and it is reasonable to suppose that they came through the fissures† which were subsequently filled by gold quartz. It is furthermore probable that the solutions came from the same source as the gold quartz.

**Conclusion as to Origin of the Deposits.**—We have in the Porcupine District pyritic gold quartz deposits enclosed in rocks characterized by an abundance of ferrodolomite, sericite and pyrite. The nature of the ore and the wall rock suggests that the gold was introduced into the fissures along with the chief constituents of the minerals mentioned. The solution which contained the gold probably contained also in some form iron, sulphur, silica, potassium and carbon dioxide. From the solution practically all the potassium and carbon dioxide escaped into the wall rocks and aided in the formation of sericite and ferrodolomite. Part of the iron and sulphur also escaped into the wall rocks and there formed pyrite crystals and contributed iron to the formation of ferrodolomite. Part of the iron and sulphur and nearly all of the gold and silica was deposited in the fissures themselves. It appears that the walls were more readily penetrated by some constituents than by the others, and in this way much of the water, carbon dioxide, potassium, sulphur and iron escaped. In proportion as these constituents escaped the solubility of the gold in the remaining solution would be decreased and the deposition therefore aided by removal of solvent as well as by lowering of temperature. The pyrite first formed in the veins was comparatively poorly crystallized and was probably formed quickly. The pyrite in the wall rocks and some pyrite in the veins that is probably of secondary origin is in well-formed crystals and evidently formed slower or at least under some more favourable conditions than did the original auriferous pyrite of the quartz veins. The gold and pyrite were not evenly distributed originally. Evidently in the first crystallization they tended to segregate here and there, and the especially favourable place for deposition was near the walls or around masses of enclosed rock.

After the filling of the fissures with quartz, gold and pyrite, the veins were shattered and the quartz granules strained or crushed. In the crushed zones a secondary set of minerals, including sericite, chlorite, calcite, ferrodolomite and pyrite and some gold were deposited. These probably originated in the vein and wall rocks. Much of the gold thus formed is in coarse grains, which probably grew by slow accretion of small particles by a process continued over a long period. It is probable that this coarse gold grew at the expense of the fine gold contained in the vein matter in its immediate neighbourhood, thus leaving much very low-grade quartz in the vicinity of the spectacular specimens. The coarse gold to which a secondary origin is here attributed, while showy, is usually quite subordinate in amount to the fine gold, much of which may well be still in the form in which it was first deposited with the pyrite and quartz. Some fine gold, however, is probably secondary, and there are cases in which the amount of secondary gold is greater than the amount of primary.

There is nothing to indicate that the character of the deposits has to any considerable degree been changed since the glaciers cleaned away the surface rocks, and there is therefore no reason for believing that the ore will show any appreciable dependence on the present surface. The secondary changes which have taken place are not surface alterations, but rather of a character which might be expected to take place at considerable depth.

From the information at present available, therefore, no remarkable change in the character of the ore with increasing depth is to be expected. It is also likely that in some cases at least similar ore shoots exist below those exposed. To what depth the individual ore shoots exposed at surface extend cannot be predicted, but unequal depths may be expected. Of those which had originally somewhat similar vertical dimensions, it is probable that some had lost very largely and others comparatively little by erosion. A first approximation is therefore obtained by assuming that one-half has been eroded. If we assume also that the vertical and lateral dimensions were originally somewhat nearly the same, our best guess, where no development work has been done, is that the ore shoot now extends to a depth equal to one-half the horizontal length. It is quite possible and, from the geological evidence, very probable that some of the deposits continue to great depth.

*Microscopic descriptions by C. W. Knight and A. G. Burrows of some of the wall rocks are given in the reports published by the Ontario Bureau of Mines. The ores and wall rocks of the Vipond mine were described by J. Stansfield in Canadian Mining Journal, Feb. 15, 1911, pp. 109-115. The ores and wall rocks at the Dome, Hollinger and Rea mines were described by R. E. Hore in a paper submitted to this Institute in 1911, pp. 171-184, vol. xiv.

†Remarkably similar characters were found by Lindgren in wall rocks of California gold quartz deposits. He gives descriptions and chemical analyses of these rocks in a paper on "Metasomatic Processes in Fissure Veins." Genesis of Ore Deposits read at Washington meeting (1900) A. I. M. E., and republished on pp. 586-588. In another paper entitled "Metasomatic Processes in the Gold Deposits of Western Australia," Econ. Geol. Vol. 1, 1905, pp. 530-544, Mr. Lindgren describes similar features of the Kalgoorlie gold fields, and concludes that the remarkable similarity of the rock alteration at the Mother Lode (California) mines to that at Kalgoorlie gold fields, and concludes that the remarkable similarity of the bearing veins from solutions practically identical in their general composition.

# THE NICKEL DEPOSITS OF SUDBURY DISTRICT

By A. P. Coleman.

The nickel ores which give economic importance to the region are of a very uniform and monotonous character. In all the larger mines the ore consists of pyrrhotite in largest amount with subordinate quantities of pentlandite, (Ni Fe)S and chalcopyrite. The pentlandite may be finely disseminated through the pyrrhotite and not apparent to the eye, but polished surfaces of the ore, as shown by Campbell and Knight, prove its presence under the microscope. The ore always contains small quantities of the norite minerals and sometimes fragments of norite or country rock. The country rock may be any of the older formations, sediments of the Sudbury series, acid or basic eruptives, or Laurentian gneiss, without in any way affecting the ore deposits; but no ore deposit has yet been found without norite. "No norite, no ore," is the law of the district. There are, however, long stretches of the norite edge where no ore occurs, where the sheet is unusually narrow, or where the country rock bends inwards instead of outwards. There are cases where the norite edge is gossan covered continuously for more than a mile, as in the vicinity of the Murray mine.

The ore bodies may be divided into two principal kinds, marginal deposits, at low points or bays on the edge of the norite; and offset deposits, where channels lead out from such bays conveying the ore mixed with norite to various distances from the edge, sometimes even three or four miles.

The best example of a marginal deposit is at Creighton, where one of the largest bays of the norite edge has furnished the greatest nickel mine worked in the district or in the world up to the present. The Creighton mine began as an open pit, which is now nearly 300 feet deep, with lower levels worked by underground mining. The country rock is granitoid gneiss and the ore body which rests upon it dips 34 degrees inwards towards the central line of the nickel basin. The ore is unusually rich, containing about 6 per cent. of nickel and copper, the latter making up a quarter of the whole, and specimens showing pentlandite are often found. It may be distinguished from the enclosing pyrrhotite by its octahedral cleavage and brassy colour as compared with the bronze of the more common mineral. The greenish yellow of the chalcopyrite is more easily recognized.

It is interesting to find that the dikes of fresh diabase cutting the rock and ore in various directions are glassy against the ore, which was a good conductor of heat, and only fine grained against norite or gneiss where the chilling was not so rapid.

The best examples of offset deposits are at Copper Cliff, where a large bay of norite narrows towards the southeast into a dike-like band of norite and ore which ends in the great columnar ore deposit of No. 2 mine. The open pit gives a good opportunity to see the shape of a characteristic offset deposit, which has been followed downwards for more than 600 feet.

A quarter of a mile to the south is the once renowned Copper Cliff mine, a still better example of this type, which reached nearly 1,300 feet in depth on an incline of 77 degrees to the east, and for years supplied the richest ore in the district, averaging nearly 9 per cent. Most offset mines are richer in copper than the marginal mines and the Copper Cliff ore contained more copper than nickel, justifying its name.

Two other deposits have been worked to the southwest and south at intervals of a quarter of a mile and of three quarters of a mile, but they were of minor importance. All of these ore bodies are associated with some norite spotted with blebs of ore, but they show no surface connections with one another or with the main mass of norite and must have been supplied by devious channels between the shifting blocks of country rock. Whether these channels still exist beneath the surface or were above the present level is uncertain. Probably the present surface is thousands of feet below the original one, so that connections from above might have been eroded away.

The columnar deposits at Copper Cliff and No. 2 mine are not the most extraordinary of their kind, since two still smaller columns have been followed downwards for 1,600 feet at Victoria mine.

The Copper Cliff offset deposits occur in contact with a variety of country rocks such as granitoid gneiss and greenstone among eruptives, and greywacke and pink quartzite of the Sudbury series among sediments, without any change in the character of the ore; and they are cut by dikes of granite and diabase which have likewise had no appreciable effect in changing the original ores.

In addition to typical offset deposits where the connection with the basic edge of the nickel eruptive is manifest, there is one very important band of gossan and ore which runs nearly parallel to the edge of the norite with no suggestion on the surface of any connection. This is the Frood-Stobie offset north of Sudbury, the largest known body of ore in the district. There must have been subterranean channels through which the pyrrhotite-norite and ore reached their present position in this unique case. The Frood-Stobie offset runs as a narrow gossan covered ridge with one or two interruptions for nearly two miles from southwest to northeast, and touches several types of rock, such as greywacke and greenstone, but nowhere comes within three-fourths of a mile of the norite edge.

Diamond drill cores prove that the deposit dips at first with an angle of 60 degrees or 70 degrees toward the norite, while at a greater depth the inclination flattens decidedly suggesting a broad underground connection wih the parent eruptive sheet.

The Frood-Stobie offset has been proved to contain more than 35,000,000 tons of average ore and far surpasses in magnitude any other known ore body in the Sudbury region. It has already furnished half a million tons of ore, and shafts are now being sunk by both Canadian Copper Company and the Mond Company, so that it will soon add greatly to the quantity mined in the district.

*Extracts from Guide Book No. 7, published by Geological Survey of Canada for Twelfth International Geological Congress.

# ANNUAL REPORT OF THE MINISTER OF MINES FOR BRITISH COLUMBIA FOR 1912

(Continued from August 15th Issue.)

### Quantity and Sources of Ore Mined.

The total quantity of ore mined in 1912 was 2,688,-532 tons, which was 472,104 tons more than in any other year, equivalent to an increase of 21.3 per cent. over the tonnage of 1910, previously the highest year. The percentage of production of the several districts was as follows: Boundary, 74 per cent.; Rossland, 9.07 per cent.; Coast, 8.03 per cent.; Slocan, 5.07 per cent.; Nelson, 1.94 per cent.; East Kootenay, 1.87 per cent.; all other parts of province, 0.02 per cent.

Taking the province as a whole there was 790 tons of ore mined during the year for each of the 3,402 men employed in and about the shipping mines. The quantities ranged, in connection with divisions or districts that produced more than 50,000 tons in the year, from 2,354 tons a man in Boundary district, down to 178 tons in Nelson division.

### Output of Coal and Coke.

The gross output of coal mined in 1912 (which includes the coal made into coke) was 3,025,709 tons (2,240 lb.) as compared with 2,297,718 tons in 1911 and 3,139,235 tons in 1910. Had it not been for labour troubles at the mines of the Canadian Collieries (Dunsmuir) Limited, during the last quarter of the year, a result of which was that the output of those mines was about 150,000 tons less than in 1911, there is little doubt that 1912 would have been the record year for production of coal in the province. However, the year's output was only 113,526 tons less than that of the record year—1910—so that with this single exception it was greatly in advance of that of any other year. The net output of coal, that is, after deduction of 396,905 tons made into coke, was 2,628,804 tons, as compared with 2,193,062 tons in 1911 and 2,800,046 tons in 1910. In the last mentioned year, though, the quantity made into coke was somewhat smaller—339,-189 tons. The coke production for three years was: In 1912, 264,333 long tons; 1911, 66,005 tons; and 1910, 218,029 tons. Only in one other year has there been a larger production of coke than in 1912, namely, in 1905, when the output was 271,785 tons. It will be seen that while there was a net decrease in output of coal in 1912, as compared with 1910, of 171,242 tons, there was an increase in coke of 46,304 tons. The difference in value of coal and coke produced in 1912, as compared with 1910, was $321,523, the respective totals having been $10,786,812 in 1912, as against $11,108,335 in 1910.

The gross production of the several collieries was as follows:

| | Long tons. | |
|---|---|---|
| Vancouver Island— | | |
| Canadian Collieries (Dunsmuir) Ltd. | 741,569 | |
| Western Fuel Co. | 576,797 | |
| Pacific Coast Coal Mines, Ltd. | 151,589 | |
| Vancouver-Nanaimo Coal Co., Ltd. | 88,253 | |
| | | 1,558,208 |
| Queen Charlotte Islands— | | |
| British Pacific Coal Co., Ltd. | | 32 |
| Nicola Valley— | | |
| Nicola Valley Coal & Coke Co., Ltd. | 142,973 | |
| Inland Coal and Coke Co., Ltd. | 31,300 | |
| Diamond Vale Collieries, Ltd. | 3,310 | |
| | | 177,583 |
| Similkameen— | | |
| Princeton Coal and Land Co., Ltd. | 28,174 | |
| United Empire Mining Co. | 500 | |
| | | 28,674 |
| Crow's Nest— | | |
| Crow's Nest Pass Coal Co., Ltd. | 950,706 | |
| Hosmer Mines, Ltd. | 188,243 | |
| Corbin Coal and Coke Co., Ltd. | 122,263 | |
| | | 1,261,212 |
| Gross production of coal | | 3,025,709 |

Of the 264,333 tons of coke, the Crow's Nest Pass Coal Company produced 218,954 tons, and the Hosmer Mines, Ltd., 45,379 tons.

A table in the Report shows the output of coal and per capita production of the districts and province over a period of six years—1907-1912. Taking two years (for reasons previously explained 1911 is not taken), the following figures will be of interest:

| | Districts. East Kootenay. | Coast. | Whole Province. |
|---|---|---|---|
| For year 1910— | | | |
| Gross tons of coal mined | 1,365,119 | 1,774,116 | 3,139,235 |
| Total number of employees | 3,111 | 4,647 | 7,758 |
| Tons of coal mined in year per employee | 439 | 382 | 404 |
| Number of men employed underground | 2,374 | 3,529 | 5,903 |
| Tons of coal mined per underground employee | 575 | 502 | 532 |
| For year 1912— | | | |
| Gross tons of coal mined | 1,261,212 | 1,764,497 | 3,025,709 |
| Total number of employees | 2,410 | 4,720 | 7,130 |
| Tons of coal mined in year, per employee | 523 | 374 | 424 |
| Number of men employed underground | 1,780 | 3,495 | 5,275 |
| Tons of coal mined per underground employee | 708 | 504 | 574 |

### Markets and Prices for Coal and Coke.

The following excerpt from the comments of the Provincial Mineralogist will serve to give brief information relative to the markets for the coal and coke produced, and prices ruling for the former:

"The coal fields of the province which are at present producing may be divided into main divisions—those of East Kootenay district and of the Coast district. These fields, from their geographic positions—the one at the extreme eastern boundary of the province, and the other at the extreme western edge—are in no way competitors in the market, their markets being quite separate and ruled by completely different conditions.

"The market of the East Kootenay field is provided primarily by the railways of the south-eastern part of the province and of the northern parts of the adjoining States of Montana and Washington, approximately two-thirds of the coal sold as such being exported to those states, while the other one-third goes to supply the demands of the south-eastern part of the province —its domestic needs, railways, steamboats, mines, and smelters. Coke, a product of the coal mines, is sold in the same markets, with the difference that the local consumption—chiefly by the smelters of Trail and the Boundary district—takes more than 80 per cent. of the product, while 20 per cent. is exported to the states mentioned. As regards the marketing conditions in this field, the East Kootenay collieries are, however, brought into direct competition with the collieries of Alberta just over the provincial boundary line, all these collieries being in the same coal field, with practically the same grade of coal and working under similar conditions. This competition has kept the price obtainable for coal from $2.25 to $2.50 a ton, with little probability of any material increase in price, owing to the facility with which new collieries can be opened and the very large reserve areas of coal in that district.

"The Coast district may be subdivided into two fields—the Nicola-Princeton and the Vancouver Island fields—in which the markets differ considerably. In the former field the consumption is chiefly by the local railways, while a small amount of coal finds its way to Vancouver, even under the handicap of what seems to be an excessively high freight charge. The Vancouver Island coal market is provided by the domestic and manufacturing requirements of the Coast cities, and of the ocean-going steamers calling at these ports. The demand for coal from the larger coasting steamers and from the railways has in the last two years diminished, as the Canadian Pacific Railway main line engines are nearly all burning California crude oil, and a large coasting steamer burning coal is now an exception. Notwithstanding the heavy consumption of crude oil, the coal sales have remained about constant, approximately 70 per cent. of the coal sold having been for use in British Columbia, 20 per cent. exported to the United States, and 10 per cent. to other countries, chiefly Mexico. In the Coast district the demand for export coal has been so great and constant, particularly on the seaboard, and the prices obtainable so satisfactory to the shippers, that it has permitted of the domestic price being kept at a figure so high as to admit of the importation from California of fuel oil as a competitive fuel, where conditions permit of its use. It would appear, therefore, that the present price of coal on the seaboard, of from $4 to $4.50 f.o.b, is not liable to decrease for some time."

### Where the Bulk of the Metals is Mined.

Of the total of $555,500 for placer gold, $230,000 is from Cariboo and Quesnel divisions, $290,000 from Atlin, and the remaining $35,500 from other parts of the province, which are comparatively small producers of this metal.

Rossland mines contributed lode gold to the value of approximately $2,730,000, which was rather more than one-half of the total (of $5,322,442) for the whole province, Boundary district mines $2,167,000, Nelson division mines $362,000, those of the Coast nearly $52,000, and about $11,000 from other parts.

Of the total value of the output of silver—$1,810,-000—Slocan and Ainsworth silver-lead mines are credited with $1,132,000, Boundary district (in which the precious metals occur in association with copper) $225,000, East Kootenay $222,000, Nelson $95,000, the Coast about $61,000, Rossland $50,000, and Lardeau $25,000.

Lead was produced chiefly in the Ainsworth-Slocan district and in East Kootenay. The former produced $877,000 out of a total for the province of $1,805,000, while East Kootenay's output was valued at $824,000. The proportion from Nelson division was $92,000, that from Lardeau $9,000, and a small quantity from Portland Canal division.

Boundary district produced copper to the value of $5,453,000, the Coast $2,536,000, and Rossland $415,-000. The small remainder of the total of $8,408,000 was from Nelson division.

The production of zinc was about $308,000 from Slocan mines and $8,000 from North-east Kootenay.

### Some Noteworthy Features of Report.

In addition to much interesting and valuable comment by the Provincial Mineralogist, under the head of "Progress of Mining," there are other features of the report that are noteworthy. These include the reports of the Provincial Assayer and the Secretary of the Board of Examiners for Coal Mine Officials, respectively; those of the gold commissioners for the more important of the districts; the several special reports and compilations by the Provincial Mineralogist, and an illustrated report by Mr. C. F. J. Galloway on the "Coal Measures of the Peace River Canyon."

Among subjects of interest concerning which there also is information are the following: Reports of the Provincial Mineralogist and Mr. Geo. Watkin Evans on the Groundhog coalfield; that of the Provincial Mneralogist on his further investigations into the alleged finding of platinum and metals of that group in certain dikes in the vicinity of Nelson; several short reports on field work by the Provincial Assayer; on Dease Lake district, by the Provincial Mineralogist, and a comprehensive review of coal mining in the province by the same official. A valuable feature is the lengthy report of the Chief Inspector of Mines (Mr. Thomas Graham), who took office on January 1, 1912, in which are included a review of accidents in coal mines, mine rescue work, first aid to the injured, metalliferous mine accidents, an account of attendance at the Fourth Annual Convention of the Mine Inspectors' Institute of the United States of America, held last summer at Columbus, Ohio, and a report on an explosion at the Diamond Vale coal mine in March, 1912. The several reports of the district inspectors of mines are also of value.

### Report is Well Illustrated.

Reproductions of photographic views are numerous in the report, many of the half-tones being excellent, and well printed. Zinc-line cuts and lithographs are also used for illustrative purposes; among these is a sketch map of part of Laird, Stikine and Skeena mining divisions, compiled and drawn by Mr. Harold T. Nation, of the Provincial Mineralogist's office.

A full index makes the report complete. Generally this publication is well up to the high standard reached in other recent years, and is a really useful publication, reflecting credit on the Provincial Mineralogist, who did the chief work in its preparation, on the officials who assisted him, and on the British Columbia Government printing office for its excellent printing and press work.

# MICHIGAN COPPER MINERS' STRIKE

A representative of the Western Federation of Miners has given out the following statement in reply to that of the operators, from which we quoted in our last issue:

"At a later date I may compare the records of the Mine Operators' Associaton with that of the Western Federation of Miners. When I do it will not be necessary for me to bolster up our cause with such falsehoods as disfigured the operators' statement. The naked truth will be sufficient to win the plaudits of mankind for an organization that has been instrumental in putting more eight hour laws on the statute books of states and provinces than all others combined, has raised wages, improved working conditions, has been the voice of the silent ones who could not tell the story of their wrongs and whose individual protests were met by a time check in the hands of employers who were ruthless toward human rights. The mine operators of Michigan may eulogize themselves. No one else will. The 5,000 mine workers who have left the district because of wages and working conditions and the solid organization of those who remain makes sufficient comment. The Western Federation of Miners has done all in its power to alleviate and improve the conditions of the metal mine workers. When western miners have asked for improved conditions the operator has pointed to Michigan with its low wages and long hours. They have complained of the unfair advantage Michigan competitors have. Michigan operators deluded themselves with the idea that a time check for men bold enough to express discontent and a judicious use of "con" seasoned with grape salt tears at the miners' picnic could take the place of decent wages and working conditions. But neither tears nor fine words nor time checks can satisfy the workers' demands. The same men who are eulogized at picnics are lined up in the Federation and will not be satisfied until their demands are granted.

"To say that men who have been working from ten to thirteen hours a day do not desire the eight hour day enjoyed by other miners is to fly in the face of common sense. To say that miners working on company account for about $2.70 a day, and when on contract sometimes get a cipher with the rim knocked off; to say that such men will not accept a minimum of $3 a day, except under the duress of a mob, does not sound over-reasonable. That is on a par with many other statements. They wanted them so badly that not even the sheltering arms of the troops nor the tender carresses of Waddell thugs are able to seduce them from their allegiance to the union.

"To say that surface employees, many of whom enjoy the princely wage of $1.85 per day, do not desire and need an increase of 35 cents a day will not appeal to anyone who knows what is required to decently support a family: The hurried call for troops and the Governor's eager response, the evident desire of the commanding officers to put the mines in operation show the forces against us. Men with the instincts of justice and fair play will condemn the call for troops, the response to the call, and the use that is now being made of them—and all for the purpose of saving money for the mine owners and not for the preservation of peace.

"To meet representatives of their employees in conference would break a long record for disregarding the rights of others, to grant their modest demand would give peace to a community and a small measure of justice to those who have long been denied consideration.

"During the thirty-five years of the existence of the organization in Butte, Montana, twenty of it under the Western Federation, during which there have been no quarrels between the employees and employers, refutes some charges made very effectively. The men of Butte are the best paid miners on the continent, and relations between the union and the mine operators are as satisfactory to both parties as can be found. Why should not Michigan operators emulate the example of those of Butte?"

# THE CONDITION OF THE MINING INDUSTRY IN LONDON*

By A. G. Charleton, M. Inst. M.M., A.R.S.M.

Artificial and sudden "booms" are always bad, since they injure legitimate mining business, but we need, in order to make constant and steady progress, to promote sound undertakings, and new ventures are necessary to maintain mining in a flourishing condition. There can be no doubt that mining business in London at the present moment, unfortunately for everybody concerned, lacks that support from the public which is essential for its healthy development, and which formerly it used to command without any difficulty.

The present "slump" in mining is not confined to London, of course, but it is perhaps at its worst here, and the only way to lift it to its proper position is, I believe, to let the public share in its successes in place of letting them in for a succession of failures, and to put the control of operations in the hands of directors and of technical men of unquestionable professional standing, who will look after their interests properly. It is equally futile and dangerous either to generalize or to dogmatize too much in regard to mining, because it presents so many exceptions to the rule; but one may confidently hope that as time goes on the number of failures will be minimized, as education extends and the ethics of finance, as well as the ethics of the profession, are put upon a higher plane, which, properly directed, is bound to come about. It is necessary, however, to educate the public as well as the mining engineer in this conenction, and mining requires new life put into it to be lifted out of the grooves and ruts into which it has lately sunk.

In a paper which I presented to the Institution of Mining and Metallurgy in 1911 I commented upon the future of the mining industry from an economic standpoint, and pointed out the magnitude of the interest involved in the mining and metallurgical industries of the British Empire. The value of mining as a national industry of the first importance cannot be disputed, and Mr. Bedford McNeill, in his presidential address to the Institution of Mining and Metallurgy,

*From Financial Times, London.

delivered on 13th March last, pointed out "the close association of mining and capital," and justly remarked that "at practically all points (commencing at a minimum when prospecting) the mining engineer is in close contact with finance." "It is in connection with the finding and losing of capital that so many difficulties and perils occur to the members of our profession."

The record of the British enterprise will undoubtedly suffer a serious blow if bona fide mining enterprises fail to secure that consideration and public support which they have been accustomed to receive in the past from financiers.

The speculative nature of mining ventures generally cannot, of course, be disputed; but, as Mr. McNeill observes, "each successive advance of the science of mining ought to tend to equalize its increasing hazards." Nor can we lose sight of the changing conditions of the present century, both in technical progress and in financial practice, and the consequences of international competition and the extension of railways in different parts of the world. But the general trend of modern progress, particularly in the matter of technical mining education, should tend to make mining less hazardous than it was formerly, particularly if the higher standard of ethics, that I believe now obtains generally amongst mining men, is taken into account; and it is a most important factor.

The reasons advanced by recent writers for the "slump" in the mining industry do not strike me by any means as covering the ground completely, and when the ebb ends, as it will do in time, the stream of mining business will probably flow along as it used to do, but along different channels perhaps, to those which it has been accustomed to follow. You cannot change industries or malpractices in a year or a day, but they can be, and have to be, altered in process of time to meet the conditions of the day, as the public are contsantly demanding change and novelty. And they get new dresses and new dishes; but the essential components and the flesh beneath remain the same, whilst we learn from experience new and improved methods of mining and new ideas upon finance.

### Causes Summarized.

If we seek and probe the true causes which are responsible for the loss of popularity from which the mining industry is at present suffering, I venture to think that some advance may be made by locating and diagnosing the disease, for it is important to prevent dry-rot—which can be dealt with—spreading. The causes may, I think, be briefly summarized as follows:

1. The excellent security and rates of interest yielded by "gilt-edged" securities.

2. Booming trade, calling for all the available cash for investment in industrial business.

3. Mining scandals and overcapitalization, which have frightened shareholders and done injury to legitimate mining promotions.

4. The higher cost of living, which, leaving them no margin for acquiring interests in mining, has heavily taxed a number of small capitalists.

5. The practical disappearance of the old-time company promoter, who appealed to the public direct.

6. The failure of the public to discriminate between mines of different kinds like those of the Rand, and mines of a more speculative nature, since the lives of mines, like many of those in the Transvaal, are known with almost mathematical certainty, and their revenue and expenditure can be very closely estimated. As a result of this, the uninformed public have been led to expect that the same can be done in all cases, which is not, of course, the case; and to expect all mining ventures to be of this gilt-edged mining class.

7. The general policy of the big financial houses, into whose hands most of the mining business has drifted —namely, that of giving attention only to developed mines whose "present value" can be calculated fairly closely. (In fact, British engineers are not "prospecting" and London financiers are not backing them in exploring and opening up the "black-blocks" of our colonies and elsewhere, in searching for promising mineral deposits as they used formerly to do, and one would imagine that the chances, on the whole, were more in their favour now than they used to be).

8. The fact that the Stock Exchange are disposed to run mining shares too quickly up to a price at which they will not yield a rate of interest that the public expect in order to give them a fair run for their money.

9. The general state of unrest in countries like Mexico, where the mining industry is extensively carried on, and local labour troubles in Australasia and elsewhere.

The causes referred to in Nos. 1, 2 and 3 have been frequently discussed in articles and letters in the press, but little notice has been taken of the other outside influences which I have mentioned.

There have been, it is true, no notable new gold discoveries made during the past three or four years, and the value of mines that have been discovered has been discounted before the shares have reached the public. Of the new mines placed on the market, it is rare to find one that has exceeded expectations; in fact, the general rule has been to fail to come up to financial exigencies, and whilst the promoters may have made money on the deal the public have lost. So long as it is a case of prizes for the one and blanks for the other, just so long will the public hold aloof from the industry which it is so necessary to support. It is their money which makes mining enterprise possible. and when their capital is cut off, as at present, the industry suffers, carrying with it promoters and directors, who are losers in the long run by this shortsighted policy, and incidentally dragging the mining profession after them.

The vast improvements made in economic geology, metallurgy and mining engineering of late years have caused mining valuations to become much more exact, so that the buyer and seller know the value of their deals and such risks as they have to run; hence there is not the excuse there was formerly for over-capitalization or the flotation of valueless mines. If the shareholder had a fair chance to come in on bed-rock to share in the profits to a reasonable extent, and could see his shares gradually increasing in value, in the case of a good property in process of development, he would view mining in a different light and help the industry forward. Members of the mining profession have been gradually opening their eyes to this state of affairs, and in proof of this I may quote a well-known mining engineer, who has written:

During nearly four years spent in Mexico I have never met a representative of an English company who was not looking strictly for large developed properties with ore reserves and good looking bottom levels. In addition he expected to obtain easy terms and to be able to float the property immediately, and to make large profits after having provided working capital.

A developed mine rarely possesses great opportunities for new discoveries; it therefore lacks the allurement of a favourable undeveloped property which might be classed as a speculation. If only mining investments are to be endorsed we must in future confine ourselves to the mines that are now developed. This would kill the mine industry.

While the mining profession is rusting a few wealthy mine operators are gaining a monopoly over the mines and metals of the world. Mine finance companies would be more successful if they would begin to look more strenuously for favourable "prospects" and endeavour to make "mines" instead of working the "markets."

All professional men would like to see the public look upon mining shares as titles to properties instead of gaming chips.

It is time that mining people generally in London took steps to restore and maintain public confidence in mining enterprises.

Some strong remarks have been made recently, with perfect justice, about the use sometimes made of information before it reaches shareholders, and just as the officials of a company are usually precluded from dealing in its shares without the knowledge and permission of the board, the same useful provision in respect of everyone concerned in the management of a company, if put into force, would certainly do much to restore confidence in the industry. Another point to which attention has lately been directed is the suggestion that a mining engineer ought to be upon every board, so as to ensure that all technical reports were thoroughly understood and questions arising out of them might be dealt with, and not shelved without proper consideration.

**Necessity of Opening Up New Fields.**

But granted that these changes and improvements in practice were made, the necessity of opening up new fields for the industry still remains paramount. Little has been done in London of late years to open up new mining fields, and we need the discovery of some new and great gold field to galvanize mining into renewed activity. London did not share in the early development of Cobalt or Porcupine, or other such discoveries that have been made in recent years. In spite of the great advancements made of late by the engineering profession, prospecting and developing mines has been looked upon—without any sufficient reason—with distrust. It has been either from America, Germany or our Colonies themselves, that money has been found for this essential prospecting and development, which is the key to fortune in mining in most instances. You cannot win big prizes in business without taking certain chances and risks; even given the skill and knowledge that can alone command success, when it comes to the point of applying them to a definite object.

In America the trouble in regard to "prospecting," to which I have referred, has been recognized as being a serious one, and a commercial organization was started in Colorado to encourage "prospecting," it being noted that a decline of 33 per cent. had taken place in the production of metals in the State of Colorado in ten years. The Denver Chamber of Commerce, co-operating with other commercial bodies, solicited funds and appointed a committee to make contracts with prospectors and to furnish necessary outfits for a season. Money was raised and 34 parties were sent out, who made 43 "locations." The committee were of opinion that the claims held warranted further development, and a "development company" was formed to work them under the direction and management of a number of eminent engineers and leading financiers. I am not aware of what measure of success it met with, but it appears to have been a serious attempt to promote mining interests, and the people concerned in it seem to have got a fair run for their money.

The second stage—that is, after a mine has passed the point of being a mere "prospect"—is, in my opinion, the one in which the public should be encouraged to participate, because they stand the chance of making most profit out of it, provided that the undertaking is honestly financed (without having to pay too dearly for promotion expenses), intelligently directed and technically well managed.

# COMPANY NOTES

## MOND NICKEL COMPANY.

The thirteenth ordinary general meeting of the Mond Nickel Company, Ltd., was held yesterday at the Hotel Windsor, 46 Victoria street, S.W., the Rt. Hon. Sir Alfred Mond, Bart., M.P., (the chairman), presiding.

The chairman, in moving the adoption of the report and accounts, first dealt with the figures in the balance sheet, and remarked that the first item on the credit side showed an addition of £8,938, which had practically all been expended in the development of the company's mines in Canada. In the next item, the smelting and refining works, there was a large addition of over £168,000, which the shareholders would have anticipated from last year's report, in which the directors informed them that they were building a large new smelting plant at Coniston, Ontario. The largest part of the expenditure was in connection with this new smelter, and the balance was incurred in increasing the refining works at Clydach, in South Wales. On the other side of the balance sheet they had written off the reserve suspense account, £35,000. which represented the greater part of the balance of the old smelting plant, which they had abandoned since the beginning of the current financial year, when the new smelter was started. He was informed that approximately £10,000 would be required next year in order to complete the writing off of that item. The shares in other companies showed a slight increase, which was largely a nominal one. In order to deal with the housing difficulties in South Wales, they had to extend the cottage accommodation for the workmen, and a small internal company was formed for the purchase of the land and the erection of the cottages. The increase in this item consisted almost entirely of shares which they had taken in this new estate company. The suspense account had been increased by £4,000. During the year they had taken an option on a very important property in Ontario, and they always put money which they paid for options to suspense account, pro tem, so that if they did not take up the property they could write it off. The balance at credit of profit and loss account showed the very substantial and gratifying increase of £47,000 over that of the last financial year. He thought shareholders were to be congratulated on this very fine increase in the year's trading. With the sum carried forward from profit and loss account last year of £41,381, the total amount to the credit of profit and loss account after deducting fees was £232,429.

**Appropriation of the Profits.**

The directors proposed to deal with this balance as stated in the report. The dividend on the preference shares, being fixed, called for no comment. The directors had decided to make a substantial increase in the dividend on the ordinary capital. They had, he thought, a right to claim that they had acted in a conservative manner in regard to their dividend distributions. The business was a growing one, and they had every reason to anticipate a much greater development in future years to what they had seen in the past, but they had always felt it right not to pay away their profits up to the hilt. On the other hand, they thought the shareholders were entitled to a reasonable percentage of the year's earnings. The board, therefore, decided to increase the dividend to 21¼ per cent., which was an increase of 5 per cent., and would absorb the sum of £60,031. The dividend on the deferred capital moved automatically with the profits distributed on the ordinary capital. The premium on the debenture stock offered last year—namely, £3,750—had been placed to reserve, and it was proposed to place £16,250 to reserve, compared with £15,000 last year. This would bring the reserve fund up to £220,000, which he thought was a respectable figure for a company with an issued capital of £750,000. The directors had also decided to place to reserve suspense £40,000, compared with £20,000 last year. By writing off £35,000 they reduced the present reserve suspense account to £5,000, and the board felt it a wise thing to re-establish this account to a reasonably larger amount. The balance to be carried forward this year was £49,525, compared with £41,381 last year, so that they had a very substantial balance forward, which they could deal with at any time when they thought it desirable to do so. As stated in the directors' report, the progress of the operations of the company in Canada and England had been very satisfactory. Last year he mentioned that they were building a new smelting plant at Coniston, Ontario, on the most improved and up-to-date lines. It had been a long and difficult task to erect this plant in a country where they had a very long and severe winter. They were promised that the plant would be ready to operate this June, and he was glad to be able to say that so accurate was the planning and estimating of the staff in Canada that the date they gave for its completion, more than two years ago, was anticipated by a fortnight. The plant since it started had been running continuously and seemed to be in every way successful. It was a very fine plant, and occupied a very fine situation, and he and some of his colleagues intended to visit it this autumn. During the year they had been continuing the erection and the extension of the company's works in South Wales, to which he referred last year. The work was progressing satisfactorily, and it was expected that during the present financial year the plant would be completed.

**Further Mining Properties Acquired.**

As he had already mentioned, they had taken an option of one important property in Canada, which they were examining now, and on which it would be premature to express an opinion, but he might say, for the information of the shareholders, that since the closing of the last financial year they had acquired some further valuable mining properties in the neighbourhood of the properties they already possessed in Canada. They had a good opinion of those properties, and the examination which had been made of them seemed to promise valuable results. The ore reserves of the company at the present time were very much larger than they had ever been in the history of the company, and on conservative data they had no reason to doubt that the mines they possessed would supply the company with raw material for many years to come. There was no doubt that the nickel business was a developing one; it was growing every year, and as they had, in his opinion, the finest and cheapest refining process which existed to-day in the industrial world, they would be foolish not to take every opportunity of extending and developing the business from what it was now to a very much larger thing in the future.

Dr. Bernard Mohr proposed the re-election of the retiring directors, Sir Alfred Mond, Mr. Robert L. Mond, and Mr. Emile S. Mond.

Mr. Robert Mathias seconded the motion, which was unanimously agreed to.

# PERSONAL AND GENERAL

J. G. McMillan, who has been making harbour surveys at Moose Factory, James Bay, returned to Toronto August 8th, and went west on the C2 excursion of the Geological Congress.

Mr. Fred Murphy, formerly of the Canadian Copper Company's staff at Copper Cliff, and now chief engineer of the Crow's Nest Coal Company, was among those who guided the C2 excursion party to the properties at Coal Creek. Mr. Murphy is resident at Fernie, B.C.

Mr. Neil Macdonald, formerly connected with development of mining properties in Northern Ontario, is now engaged in exploration of properties in the Rice Lake district, Manitoba. Mr. Macdonald's headquarters are in Winnipeg.

Hon. Louis Coderre, Minister of Mines, Ottawa, accompanied the C2 excursion to British Columbia, and is now at Vancouver.

Among those who visited Sudbury, Cobalt and Porcupine on the C6 excursion were: Dr. Richard Beck, of Freiberg, Germany; Dr. Alfred Bergeat, Universitat, Konigsberg; W. S. Bayley, Illinois; Sir Thomas Holland, England; Dr. J. P. Krusch, Berlin; H. B. Patton, Colorado; Dr. J. J. Sederholm, Finland; Dr. C. H. Smyth, Princeton; Dr. J. E. Woodman, New York; Dr. J. Stansfield, Montreal.

Dr. Donald G. Forbes, an experienced mining engineer, who some years ago was in charge of the Silver Cup, Nettie L. and other mines in Lardeau district, British Columbia, is this field season investigating mining conditions in several Coast mining districts, for the purpose of reporting thereon to the British Columbia Department of Mines.

Mr. Robert R. Hedley, of Vancouver, B.C., has commenced doing preliminary work on the Tassoo copper property, situated on the west coast of Moresby Island, of the Queen Charlotte group, on which property there occurs an ore body more than 300 ft. wide.

Mr. W. H. Trewartha-James, for several years general manager for the Tyee Copper Company, operating in British Columbia, was recently reported by English journals to have returned to London from Northern Nigeria.

Mr. Con Wolfle and associates, of the State of Washington, have bonded some mineral claims situated in the neighbourhood of Quatsino Sound, and intend to proceed with the development of them.

Mr. R. B. Lamb, of Toronto, is in Nevada on professional work, until the end of September.

The Roberts and Schaefer Company, engineers and contractors, Chicago, have closed a contract for the building of a 600 ton capacity Holmen coaling station at St. Lambert, Quebec. Price $17,000.

Mr. W. H. Taylor, of Spokane, Washington, is mining engineer in charge of development work on a group of mineral claims bonded by Mr. P. Clark, and situated in Summit camp, in the vicinity of the headwaters of the Tulameen River.

The Committee of Management of the International Engineering Congress, 1915, takes great pleasure in announcing that Col. Geo. W. Goethals, chairman of the Isthmian Canal Commission and chief engineer of the Panama Canal, has consented to accept the honorary presidency of the Congress, and will preside in person over the general sessions to be held in San Francisco, September 20-25, 1915.

The B. F. Sturtevant Company, of Canada, Limited, have arranged for a plant in Galt, Ont. From this plant the company will handle all business in Canada, and also export to England, Australia and other foreign countries. Some of the more important apparatus which will be built are fans and blowers, planing mill exhausters, propeller fans, heating and ventilating apparatus, fuel economizers, mechanical draft, steam turbines, vertical engines, generating sets and stokers.

The members of the C2 excursion now visiting mining districts in British Columbia and Alberta, are: E. M. Anderson, Geological Survey, Edinburgh, Scotland; John Ashworth, M.E., Manchester, England; Sir Augustine Baker, Dublin, Ireland; H. E. Boeke, Dr., Professeur Mineralogisches Institut, Halle a.S., Germany; Dr. O. B. Boggild, Professeur Mineralogical Museum, Copenhagen, Denmark; Dr. L. H. Borgstrom, Universite Helsingfors, Finland, Russia; A. H. Brooks, Geological Survey, Washington, D.C., U.S.A.; R. W. Brock, Director Geological Survey, Ottawa, Canada; C. Camsell, Geological Survey, Ottawa, Canada; Cosmo T. Cartwright, Mines Branch, Department of Mines, Ottawa, Canada; J. Charbonnier, manager West Canadian Collieries, Ltd., Blairmore, Alberta, Canada; Dr. C. H. Clapp, Geological Survey, Ottawa, Canada; Hon. Louis Coderre, Minister of Mines, Ottawa, and Secretary of State; Mrs. Coderre; Lorent Edward Theodor Dahlblom, Bergmastare in Gefle-Dala District, Falun, Sweden; William J. Dick, Commissioner of Conservation, Ottawa, Canada; D. B. Dowling, Geological Survey, Ottawa, Canada; Rev. Pierre Dupaigne, Licencie-es-Sciences, Professeur des Sciences Physique et naturelles au Seminaire de Philosophie, Montreal, Canada; George Loudon Dunn, Annahill, Kilmarnock, Scotland; Dr. B. E. Fernow, Dean of Faculty of Forestry, University of Toronto, Toronto, Canada; Mrs. Fernow; O. S. Finnie, Department of the Interior, Ottawa, Canada; H. Frechette, Mines Branch, Department of Mines, Ottawa, Canada; H. E. T. Haultain, Prof. of Mining Engineering, University of Toronto, Toronto, Canada; Mrs. Haultain; Samuel McLare Gardner, Mount Vernon Colliery Co., Ltd., Glasgow, Scotland; Prof. J. C. Gwillim, School of Mining, Kingston, Canada; Prof. Dr. B. Gurich, Hamburg, Germany; Bernard Hobson, F.G.S., Sheffield, England; Dr. Thos. Cramer Hopkins, U.S.A.; R. E. Hore, Editor Canadian Mining Journal, Toronto; Dr. F. R. van Horne, Case School of Applied Science, Cleveland, Ohio, U.S.A.; Dr. J. P. Howley, Director Geological Survey of Newfoundland, St. John's, Newfoundland; Mark Hurll, Glasgow, Scotland; John McGlashan Redholmn Hurll, M.E., Glasgow, Scotland; M. Inouye, Director Geological Survey of Japan, Tokio, Japan; Hy. Goodson Ives, Andover, New Hampshire, U.S.A.; J. T. B. Ives, F.G.S., Andover, New Hampshire, U.S.A.; Gerald Jarvis, Arnprior, Ontario, Canada; Chutaro Kido, Superintendent of the Geological Institute of the South Manchuria Railway Company, Dairen, Kantoshu, Manchuria; G. Kennedy, Toronto, Canada; Paul Kukuk, Bergassessor a. D., Bochum i.W., Germany; Leon Jean Benjamin de Lamothe, General de Division, Inspector de Etudes techniques de l'Artillerie, 1 Place St. Thomas d'Aquin, Paris, France; H. M. Luttman-Johnson, H.M., F.R.G.S., Petworth, Sussex, England; C. Lebling; O. E. LeRoy, Geological Survey, Ottawa, Canada; E. Maier, Professeur titulaire en gelogie Universite de Santiago, Santiago, Chili; Dr. Siegfried G. Martius, Assistant am mineralogischpetgraphischen Institut der Universitat Bonn, Bonn a Rh., Germany; J. G. McMillan, 225 Geoffrey St., Toronto, Canada; J. McEvoy, Mining Engineer and Geologist, Toronto, Canada; Mrs .McEvoy; Jean Morel, Ingenieur civil des Mines, Boitsfort pres Bruxelles, Belgium; Donald Sutherland McIntosh, Prof. of Geology, Dalhousie University, Halifax, Canada; Bedford McNeill, London, England; Mrs. McNeill; Dr. Edward Thomas Mellor, Geological Survey, South Africa; Benjamin Leroy Miller, Professor of Geology, Lehigh University, South Bethlehem, Penn., U.S.A.; Frederick B. Peck, Lafayette College, Easton, Penn., U.S.A.; Mrs. Peck; Sidney Powers, Inst. of Technology, Boston, U.S.A.; Dr. G. Saugrain, Geologue publiciste, Paris; S. J. Schofield, Geological Survey, Ottawa, Canada; J. T. Singewald, Jr., Associate in Economic Geology, Johns Hopkins University, Baltimore, Maryland, U.S.A.; C. Spruy, Anvers, Belgium; J. T. Stirling, Chief Inspector of Mines for Alberta, Edmonton, Canada; T. Surzycki, Petrokow, Pologne-russe, Russia; W. J. Sutton, Victoria, B.C.; F. T. Thwaites, Madison, Wisconsin, U.S.A.; Dr. P. F. Hubrecht, Batavia, Netherlands-India; J. H. Valiquette, Bureau of Mines, Quebec, Canada; Stephen Vivian, Inst. M. and M., London, England; H. B. Wallis, London, England; A. G. B. Wilbraham, London, England; Dr. A. W. G. Wilson, Mines Branch, Department of Mines, Ottawa, Canada; Prof. Dr. Th. F. Wilhelm Wolff, Kgl., Landesgeologe, Frohnau b. Berlin, Germany; R. B. Murray, London, England; J. B. Tyrrell, Toronto, Ontario; Dr. B. Weigand, Deutsche Geolg., Geselschaft, Elsoss, Germany; C. W. Wright, Ingurtosu, Sardinia, Italy; Mrs. Wright; Dr. R. Zuber, Professor of Geology, University of Lemberg, Austria. Twenty-one countries are represented by these men. The party has visited the gas producing district at Medicine Hat and the Crow's Nest Pass Coal district. Thence the party proceeded up Kootenay Lake and visited the copper deposits at Phoenix. The Granby Consolidated smelter at Grand Forks, the British Columbia Copper Co.'s smelter at Greenwood, the Trail smelter and Rossland gold and copper deposits. After visiting Vancouver and Victoria the party will visit the coal mines in the vicinity of Edmonton, Alberta, and travelling east on the new National Transcontinental Railway to Cochrane, will come south to Toronto on the T. and N. O. Railway. On Friday, Sept. 5, the party will visit the gold mines at Porcupine, and on Saturday the silver mines at Cobalt. Toronto will be reached on September 7.

# SPECIAL CORRESPONDENCE

## COBALT, SOUTH LORRAIN AND GOWGANDA

Owing to the barrenness of a portion of the Carson vein the dividend has been reduced from 5 per cent. a month to 2 per cent. The dividend has always been paid in the form a 2 per cent. regular and 3 per cent. bonus. This dividend of 5 per cent, or over $88,000, has been a strain on the Crown Reserve resources for some time, but the inevitable cut might have been postponed for some months, or perhaps a twelvemonth longer, if a certain part of the Carson vein which had been counted on to produce as high grade ore as the other sections of the vein had not suddenly shown barren. The values ran out of the vein about February, but development proceeded in the hope that they might be picked up again. The secret was extremely well kept. It is most probable that the news of the barrenness of a section of the vein did leak out from Cobalt to Toronto, but it was not sent to directors. Col. Carson accepted the inevitable, frankly explained the cause of the drop in the stock, and announced the cut in the dividend. The only criticism to be heard in camp is that the cut was not made at once when it was discovered to be inevitable. It would then have been possible to slacken the terrific rate of produc-tion and get down to a low grade basis with reduced costs.

The construction of the pipe lines from Kerr Lake to Giroux Lake is being rushed with all expedition, and pumping should commence about the first week in September. The scow has been almost completed, and the two centrifugal, 3,000 gallon pumps have arrived and can at any time be unloaded on the scow and placed in a position to work.

Development below the 200 foot level of the Crown Reserve has not produced much ore, and the resources of the mine are confined to its lateral development above the 200 foot level and the as yet unprospected territory under the waters of Kerr Lake.

The Nipissing mines for the month of July shipped ore of an estimated net value of $314,115. Some of this ore, however, is customs to the Nipissing's high grade mill. The company mined ore of an estimated net value of $224,216. During July the high grade mill treated 177 tons and shipped 531,099 ounces of silver. The low-grade mill treated 7,268 tons, or almost 250 tons per day.

All the stopes at the third level of shaft 73 continued to produce a large amount of ore. The main vein has a greater height at the north end than was at first expected. The faulted extension of one of the branch veins at the third level was encountered and has a width of from two to four inches and assays three thousand ounces. Ore has been found at the fourth level for the first time. The fourth level has a depth of 330 feet, and was expected to be just below the Keewatin conglomerate contact. The north drift is in conglomerate at a distance of 195 feet from the winze. The vein in the face is two to three inches wide of 300 to 400 ounces. A raise just back of the drift shows higher values ten feet up.

The hydraulic is working on Little Silver Hill near vein 27. A vein from two to three inches wide was uncovered near vein 27 and running at right angles to it. The vein is decomposed and shows no solid material at the surface and assays 63 ounces from the mud. Some open cutting was done on vein 128. It is one inch wide, and while not uniformly high grade, there is some amount showing rich ore. The vein has a length of a hundred feet.

The Gifford mine is to be dewatered at once. A syndicate of Montreal and Toronto men, many of them connected with the Crown Reserve Mining Company, have been picking up Gifford stock on the market for some time. They have now 400,000 shares out of the 600,000 shares of a par value of 25 cents each. The Gifford is partly in Keewatin and partly in granite and adjoins the Beaver. Some time ago a shaft was sunk on contact to the 200 foot level and some drifting done, but nothing of importance discovered.

For the past two months the Cobalt Lake production has been at the rate of 25,000 ounces a week. June and July each showed an output of 100,000 ounces of silver. Alterations and additions to the mill allowed the company to go on this basis of production. Of this amount 80,000 ounces came from the mill concentrates, while 20,000 ounces is accounted for by high-grade ore sorted underground.

Speaking of the drainage of Cobalt Lake, it is hoped that the matter will be before the mining commissioner at his first sitting in September. The plans and specifications will first be presented to the Provincial Board of Health.

On the York Ontario mine a rich shoot of ore has been picked up on the intermediate level between the 70 ft. and the adit level. The vein is from three to four inches of silver in the calcite and holds good for 20 feet. Forty bags of high grade ore have already been taken out from the drift. Two cars of concentrates and high grade ore will be shipped from the mine the latter part of this month.

The Timiskaming and Hudson Bay Company paid its 49th dividend on August 19th. They now have the remarkable record of paying 23,500 per cent. on capitalization, or $1,823,835. The last dividend was for 300 per cent. as usual.

The Right of Way Mining Company has taken an option on the Flynn group of claims in Lebel Township. The properties number seven in all and lie due south of the Tough-Oakes.

Ground has been broken for the new Northern Customs mill on the site leased by them on the Nipissing property near 104, just north of the town. The four acre site has already been cleared of all underbrush and a gang of men has started on the excavations. The intention is to build a hundred stamp mill, though a battery of only eighty will at first be installed. The eighty stamps will give a capacity of 250 tons daily, and for the present will take care of all the contracts held by the company. The flow sheet will be almost identical with that used at the old mill. It is expected that the new mill will be in operation some time before the end of the year. It is a fact that three-fourths of the machinery can and will be manufactured in Northern Ontario at the Wabi Iron works.

The Chambers Ferland is now sinking a shaft to endeavour to pick up the extension of the Nipissing 64. It has now reached a depth of 40 feet. Cross-cutting will commence at between 200 and 300 feet, as prospects appear expedient. The shaft is entirely in the conglomerate. This is an endeavour to open up a section of the Chambers Ferland never prospected before save on the surface.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

Financing of future operations of the McIntyre mine will be made by the issuing of bonds to the extent of $250,000. Of this $200,000 is to be offered to shareholders. The proceeds will be used to pay off the heavy debts of the company, extend the mill, and carry on development work.

At the Tough-Oakes property in Kirkland Lake the station has been cut at 200 feet. It is expected that drifts will be started on the main vein at this level in a very short time now, while the shaft will be carried down to the 300 foot level. The vein at 200 foot level shows from 14 to 16 inches of high grade ore, though it is split up into several stringers.

The Hollinger Gold mines report for July shows a gross profit of $129,146 for the four weeks ending July 15th. The profits for the current year to date amount to $851,667. The surplus after dividends have been paid amounts to $573,469. The average value of ore treated was $19.70 per ton, against $16.50 last month. Working costs per ton amounted to $6.209 as against $5.473 in June. Work upon the winze below the 300 foot level has been continued and the winze has now reached a depth of 113 feet. The vein dipped out of the winze at 94 feet. The winze will be carried to a depth of 125 feet, and the next level will be established at 425 feet.

The mill ran 87 per cent. of the possible running time, treating a total of 10,056 tons of an average value of $19.70 per ton. The approximate extraction was 96.5 per cent. Milling costs amounted to $1.648 per ton milled.

The Alexo nickel mine, near Iroquois Falls, shipped 22 cars of ore containing 1,588,500 pounds, during the month of July.

Good results are being obtained by the syndicate leasing the Rea mine at Porcupine. The ore taken from the dump and the stope at the 100 foot level and being fed to the five stamps is running well.

## NOVA SCOTIA

**Dominion Coal Outputs.**—The coal output in July was the largest yet recorded from the Dominion mines, being 425,635 tons, compared with 409,125 tons in July, 1912, and with the highest previous output of 422,343 tons produced in October last. The individual collieries had outputs as under:

| No. | Tons. |
|---|---|
| 1 | 48,331 |
| 2 | 69,515 |
| 3 | 10,636 |
| 4 | 34,018 |
| 5 | 18,770 |
| 6 | 25,942 |
| 7 | 21,369 |
| 8 | 6,638 |
| 9 | 34,733 |
| 10 | 16,514 |
| 11 | 5,414 |
| 12 | 29,175 |
| 14 | 38,235 |
| 15 | 21,748 |
| 16 | 24,917 |
| 21 | 14,158 |
| 22 | 5,495 |
| | 425,635 |

The production from mines Nos. 14, 15, 16, 21 and 22 was the best yet obtained. The output from No. 7 Colliery has only once been exceeded, namely, in July, 1910. Satisfactory as the outputs were, they might have been much greater but for the decided shortage of men.

The total output for the seven months ending 31st July was 2,720,765 tons, compared with 2,533,283 tons for the same period last year, showing a gain of 187,-482 tons.

The output of the Springhill mines in July was 31,409 tons, compared with 31,147 tons last July. For the seven months ending July the total output was 225,206 tons, against 244,241 tons last year, showing a slight drop in production, due, of course, to the mine fire last December.

The production for August from the Cape Breton mines will probably reach 405,000 tons, and will probably be less than the output in August, 1912, as in this year the month contains one working day less than last year.

## BRITISH COLUMBIA

### Aufeas Gold Mines, Ltd.

The West Yale Review reports that on the Aufeas property, on Wardle Creek, the vein has been entered at 385 feet from the portal of the lower tunnel and at a depth of about 450 feet. The ore is similar in character to that found at the outcrop, samples of which assayed from $23 to $30 in gold and also contained a high percentage of arsenic. There was 9 feet of ore and the hanging wall had not been reached. It is intended to construct an aerial tramway and ship ore to the smeltery at Tacoma, Puget Sound, Washington.

In this connection the following excerpt from a report by Mr. Chas. Camsell, published in the "Summary Report of the Geological Survey," for 1911, will be of interest: "A group of three mineral claims, known as the Jumbo group, is situated on the west side of Silver Creek, about four miles south-west of Hope. The claims lie in a steep narrow gorge at an elevation of about 1,000 feet above the sea. The country rock is massive grano-diorite, in places sheared and traversed by fissures. The ore deposits lie in the fissure veins and have a width averaging about eight inches. They contain dull coloured arseno-pyrite and a little chalcopyrite in a gangue of quartz, and gold is the principal valuable metal in them. The value of the ore in the fissure ranges from $10 to $60 to the ton. The claims are devoloped by three tunnels of varying length, and several open-cuts. These claims and adjoining locations are now owned by the Aufeas Gold Mines, Ltd., which has recently made successful arrangements for financing the development of the property. The company intends building a wagon road from the Interprovincial highway at the mouth of Wardle Creek to the camp, and proceeding with the construction of permanent camp buildings, including cook house, bunkhouses, storehouses for supplies and tools, the laying of pipes to supply the camps with water, and the clearing of the right-of-way for an aerial tramway. As soon as the road and camp shall be ready for use, work on the lower tunnel will be begun and will be continued until the vein shall be reached."

It would appear that development work has been carried out, as proposed, and that results are very much better than surface indications gave promise of, for the vein lately cut at depth was only about a foot in width at the surface, where it was uncovered for a length of more than 300 feet.

### An Official Review.

The following information has been taken from a recently issued pamphlet, compiled by officials of the

Mines Branch of the Canada Department of Mines, under the direction of Mr. John McLeish, Chief of the Division of Mineral Resources and Statistics. The pamphlet has been prepared primarily for distribution at the International Exhibition at Ghent, Belgium. It was also intended to distribute copies of it at the International Geological Congress, held August 7-14 in Toronto. The excerpt here given relates only to British Columbia, which is shown as having an area of 355,835 square miles and a population in 1911 of 392,480. A statistical table gives quantities and value of individual mineral products for two years, 1911 and 1912, the total for the former having been placed at $21,299,305, and for the latter at $30,076,635. (In passing it may be mentioned that the Annual Report of the Minister of Mines for British Columbia shows a total value of $23,499,072 for 1911 and $32,440,800 for 1912.) After the table comes the general information, as follows:

"For many years British Columbia was the premier mining province of Canada, and was only displaced in so far as magnitude of output is concerned in 1907, when Ontario forged ahead. In a certain sense, this province is still of first importance, owing to the fact that mining is probably its most important industry. Physiographically the province embraces a series of mountain ranges beginning at the Rocky Mountain range, forming the eastern border, and extending to the Pacific coast.

"Coal and metalliferous ores, including gold, silver, copper, lead and zinc, together with clays, building stone and gypsum, constitute the chief mineral resources. Antimony, platinum, molybdenum and mercury are also found.

"With the exception of the placer gold mining of the Cariboo district, active productive mining operations are at present confined principally to the extreme southern portion of the province and to a district on Vancouver Island, and on the coast. The chief centres of activity are the Crow's Nest coal mines, the metalliferous mines of East and West Kootenay, of which Moyie, Ainsworth, Slocan, Sandon, Nelson, and Rossland are important centres, and the Boundary district, including Grand Forks, Phoenix, Greenwood and Hedley, Britannia Beach and Texada Island on the coast, and Nanaimo and Comox on Vancouver Island. The Portland Canal district has recently assumed considerable importance.

"Much prospecting and development is being undertaken at many points on or near the coast, while the construction of the Grand Trunk Pacific Railway will provide easy access to a number of districts in that portion of the interior which it traverses.

"Important smelting industries have been established at Trail, Grand Forks and Greenwood, in the southern interior, and at Ladysmith on the coast, the fuel for which is provided by the coal mines of Comox, the Crow's Nest, or of Alberta. A new copper smelting plant will be in operation at Anyox or Granby Bay in December, 1913.

"Mining locations are granted under the laws of the province to discoverers, for nominal fees, and absolute titles may be obtained by developing such properties. The mining laws include a 'Placer Mining Act,' 'Mineral Act,' 'Inspection of Metalliferous Mines Act,' 'Coal Mines Act,' 'Coal Mines Regulation Act,' etc., and full information respecting miners' certificates, the mining law and regulations, mining reports and maps, etc., may be obtained on application to the Provincial Mineralogist, Victoria, British Columbia."

**Ore Receipts at Trail.**

Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail during four weeks ended July 31 were as under:

| | Tons. |
|---|---|
| East Kootenay— | |
| St. Eugene | 66 |
| Sullivan | 2,602 |
| | 2,668 |
| Ainsworth— | |
| Bluebell | 458 |
| No. 1 | 400 |
| Retallack & Co. | 110 |
| Silver Hoard | 174 |
| | 1,142 |
| Slocan— | |
| Lucky Jim | 29 |
| Meteor | 24 |
| Rambler-Cariboo | 378 |
| Richmond-Eureka | 62 |
| Ruth | 36 |
| Slocan Star | 30 |
| Standard | 710 |
| Van-Roi | 35 |
| | 1,304 |
| Nelson— | |
| Emerald | 64 |
| Queen | 74 |
| Silver King | 131 |
| Yankee Girl | 371 |
| | 640 |
| Rossland— | |
| Centre Star Group | 11.824 |
| Josie (Le Roi No. 2) | 1.501 |
| Le Roi | 4,386 |
| | 17,711 |
| Boundary— | |
| No. 7 | 236 |
| Hazelton District— | |
| Silver Standard | 286 |
| Republic (U.S.A.)— | |
| Belcher | 248 |
| Ben Hur | 658 |
| Knob Hill | 150 |
| | 1,056 |

**Slocan Notes.**

Diamond drilling is in progress in the Van-Roi mine, in the vicinity of Silverton. An office note sent out by the company's head office in London, England, was as follows: "The work in the deep levels, Nos. 7 and 9, having established the probability that these had been driven, not on the main vein, but on a southerly vein, a policy of diamond drilling is therefore being adopted as the most rapid, efficient and economic means of exploring the large block of main vein which presumably exists in the vicinity of these workings. During the carrying out of this policy it may be necessary to temporarily suspend milling operations." Work at the company's concentrating mill on Four-Mile Creek has consequently been suspended.

A map of the Slocan mining district has been prepared by Miss Ada I. McDougald, of New Denver, who took Messrs. Drewry and Twigg's map, used in the Report of the Zinc Commission in 1906, and drew it to twice the former size, making it 37 by 52 inches.

Instead of a number on each claim, the name has been used—a useful improvement. The map has been brought up-to-date by the inclusion of all Crown-granted mineral claims in the district, and adding to the detail in other ways. So much work has been involved that the young lady has found it necessary to make a charge of five dollars each for blue-prints of the map, concerning which enquiries have come from even as far south as New Mexico.

### Granville Mining Co., Klondike, Yukon.

On August 2 The Mining Journal, London, included the following information relative to the Granville Mining Co., operating near Dawson, Yukon, in its "The Mining Market" comments:

"Granville Mining.—From a circular issued by the company, it appears that the assets have now taken the following form, the dollar holdings being converted at $4.85 as the equivalent of £1:

| | |
|---|---|
| "Canadian Klondike Mining Company— | |
| Six per cent. convertible debentures | £ 339,381 |
| Shares | 448,455 |
| Canadian Klondike Power Company— | |
| Six per cent. debentures | 247,422 |
| North-West Corporation shares | 1,020,000 |
| | £2,055,258 |

"The company has temporary loans outstanding amounting to about £50,000.

"The Canadian Klondike Mining Company has an authorized capital of $8,000,000 shares and $2,000,000 debentures.

"Of the shares the Granville Company holds 2,750,000 and J. W. Boyle 3,825,000, the remaining 2,000,000 being held in reserve for conversion of debentures. The debentures in issue, $1,646,000, are held by the Granville Company.

"The Canadian Klondike Company holds the whole of the company's interests on the Klondike watershed. Dredging began this season, and up to the present the output has been: Up to May 31, 5,189 oz.; June 1 to 28, 10,202 oz.; June 29 to July 26, 13,402 oz. gold. Mr. Boyle estimates the profits of the company for the current year at about $1,000,000.

"The North-West Corporation represents the holdings in the Indian River watershed. The nominal capital is £1,500,000, out of which the Granville Company holds £1,020,000, the North-West Syndicate £190,000, and £140,000 more was subscribed as working capital, leaving £150,000 in reserve. The plant is expected to come into operation next year.

"The Canadian Klondike Power Company has a share capital of $1,500,000, all of which is held by the Canadian Klondike Mining Company, and $1,500,000 six per cent. debentures, of which the Granville Company holds $1,200,000. The company owns and operates a water-power and electric generator station, which supplies power to the Canadian Klondike, the North-West Corporation, and also to the Yukon Gold and other customers. The Canadian Klondike Mining Company has guaranteed that the income of the Granville Mining Company from its holdings of shares and debentures of the Canadian Klondike Mining Company, and debentures of the Canadian Klondike Power Company shall up to February 20, 1928, not be less than $240,000 per annum. The capital of the Granville Mining Company is £1,500,000, of which £1,400,000 is issued. There are £900,000 six per cent. debentures in issue out of an authorized £1,000,000."

# STATISTICS AND RETURNS

### B. C. ORE SHIPMENTS.

Shipments for week ending August 18, and for year to that date, are:

| Slocan and Ainsworth. | Week. | Year. |
|---|---|---|
| Standard, mld. | 1,000 | 31,000 |
| Van-Roi, mld. | 700 | 18,007 |
| Rambler-Cariboo, mld. | 300 | 8,200 |
| Bluebell, mld. | 1,400 | 43,923 |
| Standard | 341 | 8,850 |
| Silver Hoard | 48 | 558 |
| No. 1 | 12 | 1,953 |
| Whitewater | 38 | 236 |
| Maestro | 157 | 157 |
| Noble Five | 22 | 22 |
| Other mines | ..... | 10,496 |
| Total | 4,018 | 123,392 |
| **Nelson.** | | |
| Queen, mld. | 350 | 8,925 |
| Mother Lode, mld. | 500 | 12,000 |
| Second Relief, mld. | 150 | 4,300 |
| Yankee Girl | 171 | 3,248 |
| Emerald | 35 | 718 |
| Silver King | 238 | 500 |
| Other mines | ..... | 20,768 |
| Total | 1,444 | 50,459 |
| **Lardeau.** | | |
| Ajax | 44 | 254 |
| Other mines | ..... | 56 |
| Total | 44 | 310 |
| **East Kootenay.** | | |
| Sullivan | 386 | 22,599 |
| St. Eugene | 32 | 10,003 |
| Total | 418 | 23,602 |
| **Rossland.** | | |
| Le Roi No. 2, mld. | 325 | 10,648 |
| Inland Empire, mld. | 275 | 2,925 |
| Centre Star | 2,914 | 91,790 |
| Le Roi | 432 | 35,658 |
| Le Roi No. 2 | 391 | 13,616 |
| Other mines | ..... | 199 |
| Total | 4,337 | 154,836 |
| **Consolidated Company's Receipts. Trail, B. C.** | | |
| Knob Hill | 48 | 1,604 |
| Ben Hur | 233 | 8,118 |
| Giant California | 31 | 103 |
| Bonanza | 47 | 47 |
| Standard | 341 | 8,850 |
| Silver Hoard | 48 | 558 |
| No. 1 | 12 | 1,953 |

| | | |
|---|---|---|
| Whitewater | 28 | 226 |
| Maestro | 157 | 157 |
| Noble Five | 22 | 22 |
| Centre Star | 2,914 | 91,790 |
| Le Roi | 432 | 35,658 |
| Le Roi No. 2 | 391 | 13,616 |
| Sullivan | 386 | 22,599 |
| St. Eugene | 32 | 10,003 |
| Ajax | 44 | 254 |
| Yankee Girl | 171 | 3,248 |
| Emerald | 35 | 718 |
| Silver King | 238 | 500 |
| Other mines | ..... | 34,074 |
| Total | 5,620 | 225,098 |

## SHARE MARKET.

(Courtesy of J. P. Bickell & Co.), Standard Bank Building, Toronto, Ont., Aug. 22.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| British Copper | 2.25 | 2.50 |
| Braden Copper | 6.87½ | 7.00 |
| Giroux Copper | 1.00 | 1.37½ |
| Goldfield Cons. | 1.62½ | 1.87½ |
| Greene Can. | 6.75 | 7.00 |
| Chino Copper | 39.25 | 40.00 |
| Inspiration Copper | 15.12½ | 15.25 |
| Nevada Cons Copper | 16.00 | 16.12½ |
| Miami Copper | 22.87½ | 23.00 |
| Tonopah Mining | 4.50 | 4.75 |
| Tonopah Belmont | 6.25 | 6.50 |
| Tonopah Merger | .73 | .74 |
| Standard Oil of N. Y. | 153.00 | 155.00 |
| Standard Oil of N. J. | 373.00 | 376.00 |
| Standard Oil, old stock | 1100.00 | ..... |
| Standard Oil Subs | 725.00 | ..... |

### Sundry.

| | | |
|---|---|---|
| American Marconi | 6.00 | 6.25 |
| Canadian Marconi | 2.50 | 2.75 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .01 |
| Dome Lake | .30 | .32 |
| Dome Ext. | .07 | .07¼ |
| Dome Mines | 13.00 | 14.00 |
| Foley O'Brien | .17 | .20 |
| Hollinger | 14.75 | 15.25 |
| Jupiter | .25 | .26 |
| McIntyre | 1.50 | 2.00 |
| Northern Exp. | .50 | 1.00 |
| Pearl Lake | .28½ | .29 |
| Plenaurum | .75 | .80 |
| Porcupine Gold | .06 | .07 |
| Imperial | .01½ | .02 |
| Preston E. D. | .01½ | .02 |
| Rea Mines | .15 | .30 |
| Swastika | .04½ | .05 |
| West Dome | .10 | .15 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey | .06 | .06¼ |
| Beaver | .28½ | .29 |
| Buffalo | 2.20 | 2.40 |
| Canadian | 20 | .23 |
| Chambers Ferland | .17 | .19 |
| City of Cobalt | .45 | .50 |
| Cobalt Lake | .47 | .53 |
| Coniagas | 7.00 | 7.20 |
| Crown Reserve | 1.50 | 1.51 |
| Foster | .04 | .06 |
| Gifford | .04½ | .05 |
| Great Northern | .10½ | .11 |
| Hargraves | .02 | .03½ |
| Hudson Bay | 67.00 | 70.00 |
| Kerr Lake | 3.35 | 3.50 |
| La Rose | 2.20 | 2.30 |
| McKinley | 1.73 | 1.75 |
| Nipissing | 8.90 | 9.00 |
| Peterson Lake | .20½ | .21 |
| Right of Way | .03 | .05 |
| Rochester | .02½ | .03 |
| Silver Leaf | .02½ | .04 |
| Cochrane | .35 | .50 |
| Timiskaming | .25 | .26 |
| Trethewey | .27 | .30 |
| Wettlaufer | .11 | .12 |
| Seneca Superior | 2.10 | 2.40 |
| Lucky Cross | .15 | .22 |

## TORONTO MARKETS.

Aug. 25—(Quotations from Canada Metal Co., Toronto).

Spelter, 5½ cents per pound.
Lead, 5.75 cents per pound.
Tin, 44 cents per pound.
Antimony, 9½ cents per pound.
Copper, casting, 16¼ cents per pound.
Electrolytic, 15¾ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Aug. 25—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $19.20 (f.o.b. Toronto).
Midland No. 2, $19.00 (f.o.b. Toronto).

Aug. 25—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, $7.50 per ton.
Coal, bituminous, lump, $5.00 per ton.

## GENERAL MARKETS.

### Coke.

Aug. 22—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $3.00 per ton.

Aug. 22—Tin, straits, 41.30 cents.

Copper, Prime Lake, 15.75 to 15.85 cents.
Electrolytic Copper, 15.60 to 15.70 cents.
Copper wire, 16.75 to 17.00 cents.
Lead, 4.75 to 4.85 cents.
Spelter, 5.87½ cents.
Sheet zinc (f.o.b. smelter), 7.75 cents.
Antimony, Cookson's, 8.37½ cents.
Aluminum, 22.50 to 23.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $44.50 to $45.00 per ounce.
Platinum, hard, $50.00 to $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $39.00 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| August 13 | 59⅛ | 27¼ |
| " 14 | 59 | 27 3/16 |
| " 15 | 59¼ | 27 5/16 |
| " 16 | 59⅛ | 27¼ |
| " 18 | 59⅛ | 27¼ |
| " 19 | 59⅛ | 27¼ |
| " 20 | 59¼ | 27 5/16 |
| " 21 | 59¼ | 27 5/16 |
| " 22 | 59¼ | 27 5/16 |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Astley, J. W.
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Evans, J. W.
Ferrier, W. F.
Forbes, D. L. H.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
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Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
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Willmott, A. B.

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DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Ross, J. G.
Woolsey, W. J.

**British Columbia**

Ashworth, James
Fowler, S. S.

**FOREIGN-New York**

Hassan, A. A.

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Dr. J. T. Donald

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## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

# DEPARTMENT OF MINES GEOLOGICAL SURVEY.

## PUBLICATIONS

**The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.**

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

**CANADA**

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

**NEW BRUNSWICK and NOVA SCOTIA**

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

**QUEBEC**

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

**ONTARIO**

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.

**NORTH WEST PROVINCES**

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.

**BRITISH COLUMBIA**

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

**YUKON AND NORTH WEST TERRITORIES**

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

**CANADA**

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

**NOVA SCOTIA**

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

**NEW BRUNSWICK**

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

**QUEBEC**

1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

1202. Map 52A. Northeast part of the Serpentine Belt, Eastern Townships, Quebec. Geology. Scale 4 miles to 1 inch.

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1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.

**ALBERTA**

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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1260-1276. Maps 74A-90A. Geology of the Forty-ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.

1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch.

1247. Map 69A. Route map of part of Nass River, British Columbia. Scale 8 miles to 1 inch.

1168. Map 30A. Mother Lode and Sunset mines. Geology and Topography. Scale 400 feet to 1 inch; contour interval 20 feet

1200. Map 50A. Part of Portland Canal Mining Area. Topography. Scale 2 miles to 1 inch; contour interval 200 feet.

**YUKON and NORTH WEST TERRITORIES**

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

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# PROVINCE OF QUEBEC

**Department of Colonization, Mines, and Fisheries**

***The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.***

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
**HALIFAX, N. S.**

## ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamations—**
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Northern Canada Supply Co.

**Assayers and Chemists—**
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Mussens, Limited.
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B. Greening Wire Co., Ltd.
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Mussens, Limited.
Northern Canada Supply Co.

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Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
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Fraser & Chalmers, Ltd.
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Peacock Brothers.
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Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Roessler & Hass lacher.
Mussens, Limited.
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Peacock Brothers.

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S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
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**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
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Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**
Canadian Allis-Chalmers, Ltd.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Northern Canada Supply Co.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Standard Diamond Drill Co.

**Drills—Diamond.**
American Diamond Rock Drills.
Sulivan Machinery Co.
Northern Canada Supply Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.

**Drills—Electric—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dump Cars—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Mussens, Limited.
Orenstein-Arthur Koppel Co.

**Dynamite—**
Curtis & Hersey (Canada), Limited.
Canadian Explosives.
Northern Canada Supply Co.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
iSemens Co. of Canada, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Elevators—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Krupp, Fried. A. G., Germany.
M. Beatty & Sons.
Sullivan Machinery Co.
John McDougall Caledonian Iron Works.
Northern Canada Supply Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.

**Engineering Instruments—**
C. L. Berger & Sons.
Peacock Brothers.

**Engineers and Contractors—**
Fraser && Chalmers, Ltd.
Krupp, Fried, A. G., Germany.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
Waterous Engine Works Co.
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
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Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
M. aeBtty & Sons.
Canadian Westinghouse.
John Inglis & Co., Ltd.

**Engine—Haulage—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
The John Englis Co., Ltd.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Brothers.

**Engines—Steam—**
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E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Smart-Turner Mahine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.

**Fans—Ventilating—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.

**Feeders—Ore—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Mussens, Limited.

**Filters—**
Krupp, Fried, A. G., Germany.

**Forges—**
Mussens, Limited.
**Can. Fairbanks-Morse Co.**
Northern Canada Supply Co. Ltd.

**Forgings—**
M. Beatty & Sons.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.

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Krupp, Fried. A. G., Germany.
Lymans, Limited.
Mussens, Limited.

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Curtis & Hersey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
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Krupp, Fried, A. G., Germany.
Smart-Turner Machine Co.
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Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada., Ltd.

**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

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## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
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Peacock Brothers.
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Northern Canada Supply Co.

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Jones & Glassco.
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Jenckes Machine Co. Ltd.
M. Beatty && Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

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Peacock Brothers.
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Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

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Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
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Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
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Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.

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Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.

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Orford Copper Co.

**Motors—**
Mussens, Limited.
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Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

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Can. Fairbanks-Morse Co.
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Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

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Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

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Canadian Allis-Chalmers, Ltd.
Fraser && Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
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Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
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Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
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Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
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**Pipe Fittings—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
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Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
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Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
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Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
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Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Small-Turner Machine Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
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Can. Fairbanks-Morse Co.
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Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
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E. Leonard & Sons.
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Canadian Ingersoll-Rrand Co.

**Pumps—Rotary—**
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Mussens, Limited.
E. Leonard & Sons.
Can. Ingersoll-Rand Co.

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Can. Fairbanks-Morse Co.
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Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
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**Quarrying Machinery—**
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Sullivan Machinery Co.
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Fraser & Chalmers, Ltd.

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**Stamp Mills—**
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**Water Wheels—**
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Jenckes Machine Co.
Krupp, Fried. A. G., Germany.

**Wheels—**
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Krupp, Fried. A. G., Germany.
Jeffrey Mfg. Co.

**Winding Engines—**
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Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
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Can. Allis-Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.
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**Wire (Bare and Insulated)—**
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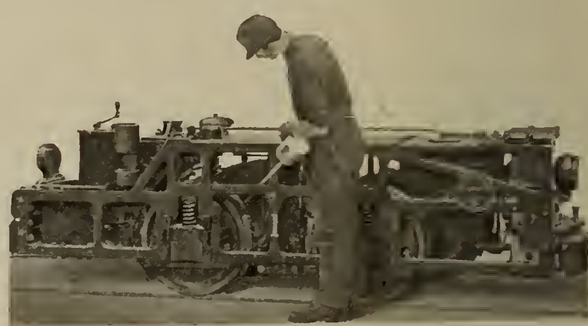

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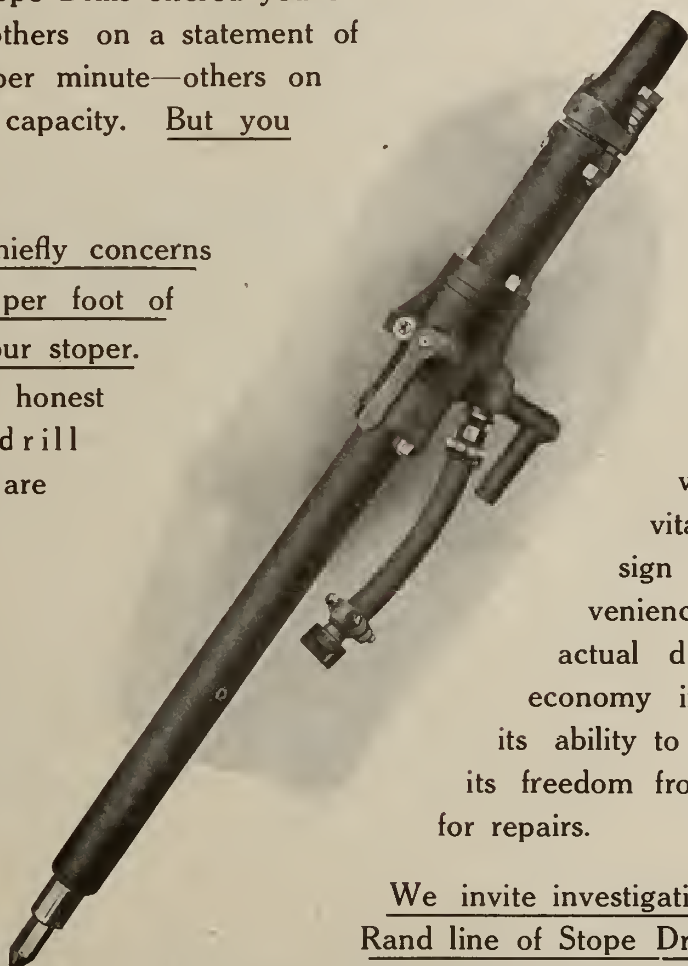

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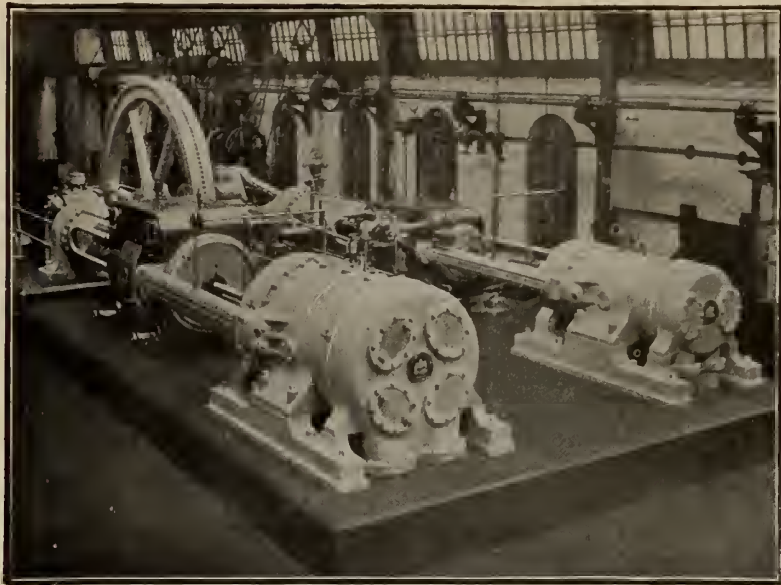

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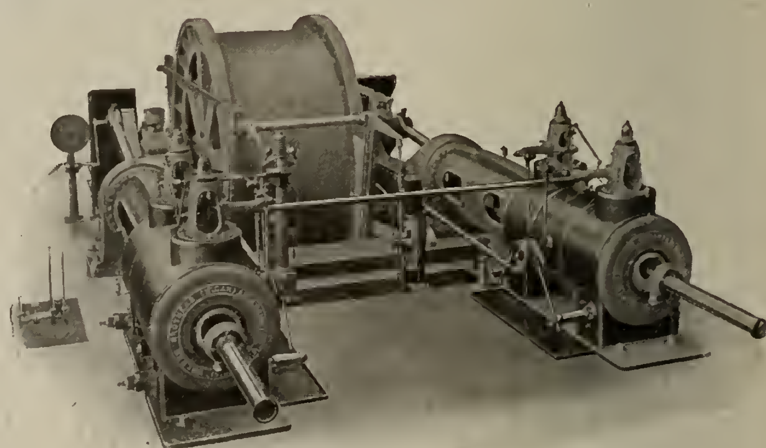

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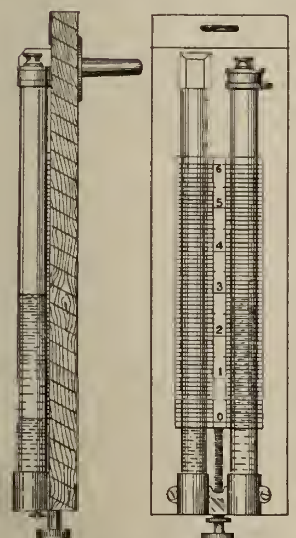

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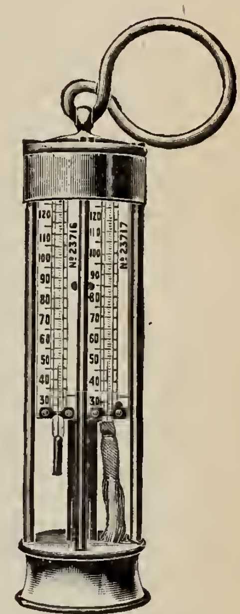

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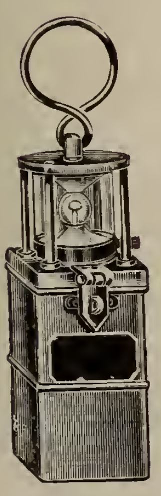

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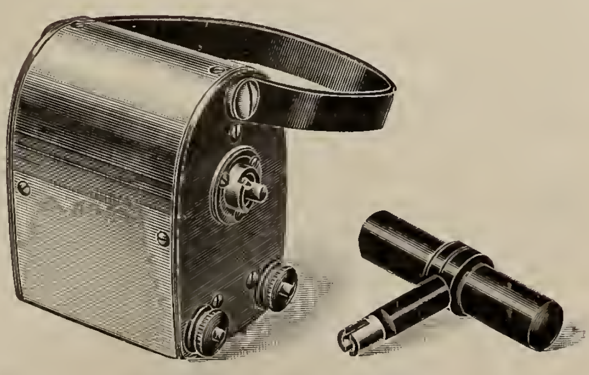

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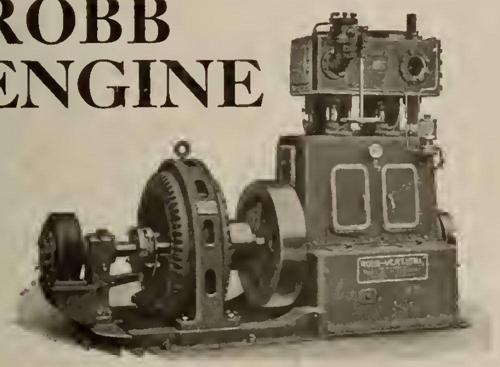

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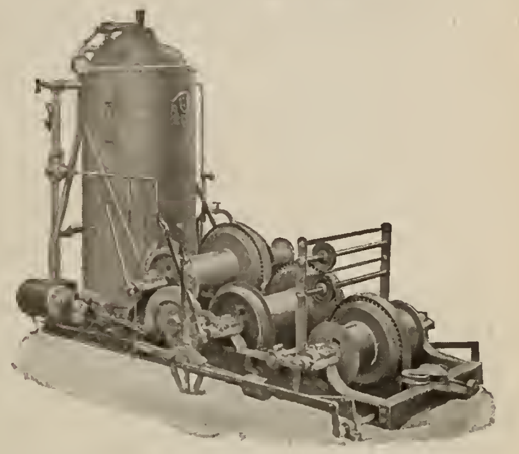

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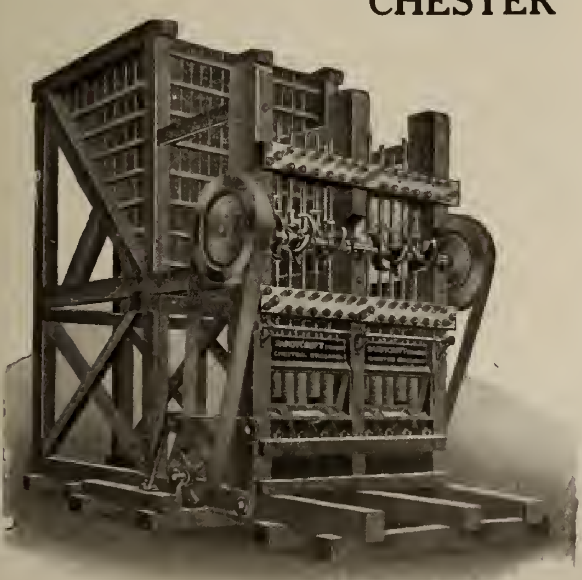

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, September 15, 1913. No. 18

## The Canadian Mining Journal

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"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.



## NANAIMO COAL MINERS' STRIKE

The coal mining industry of Vancouver Island has for several months been in very bad condition. Recently grave disorders have occurred and damage has been done to life and property.

It is stated that strikers have set fires underground and burned mine buildings and dwellings. Men trying to put out the fires and save property have been attacked and brutally assaulted. Desperate characters, who were not in the employ of the companies when the trouble started last September, are now present in large numbers. There seems to be reason to believe that such men have been brought in solely to bring about the present conditions at Nanaimo. If this be true, the organization responsible for bringing them into Canada cannot be too strongly condemned.

The trouble started at the Canadian Collieries, where the miners went out on strike last September. Since May 24 the other collieries have also been idle, the men not going back to work after the holiday. A series of riots has occurred.

As the local authorities were quite unable to enforce the law and prevent disorders, the militia were called in. Several of the leaders of the United Mine Workers, the organization which is endeavouring to gain a foothold in Nanaimo, have been imprisoned and order restored.

For the present the most important duty of the Government is to teach the disorderly element that the laws of the country must be obeyed, that violence will not be tolerated, and that prompt punishment will be meted out to offenders. Until this lesson has been taught no lasting settlement of disputes between operators and strikers is likely to be arrived at.

## THE RUSH TO SHUSHANNA

During the past few months there has been a rush of prospectors to the Shushanna district, Alaska. The reports state that Mr. James, the original discoverer, took out $300 per day from the creek bottoms. Others have not been so fortunate; but a large area has been staked. Dr. D. D. Cairnes, of the Geological Survey of Canada, who is familiar with the district, has issued a warning to stampeders, stating that it will be inadvisable to go in without a good outfit. It will be necessary to spend the winter there. Already a large number of prospectors are on the ground and the most promising ground was staked some time ago. There is, however, a large area which may prove to be mineral-bearing, and much prospecting will doubtless be done far from the original discovery.

## MINING IN BRITISH COLUMBIA

Canada's Pacific province has long been one of the most productive of mineral wealth. The industry is in a flourishing condition, and the value of the output for 1912 was much greater than that of any previous year. 1911 was an off year, owing chiefly to prolonged labour troubles in the East Kootenay coalfield, and it is therefore pleasing to record the marked change for the better.

## KOOTENAY MINING MEN WANT A COMMISSION

For several years the Nelson mining district in British Columbia has been known to contain large deposits of zinc and lead ores. A few mines have been profitably operated; but a large number of the deposits are under present conditions not workable. Efforts have been made to secure Government aid, so that a large industry may be built up. It is the belief of several of those interested that with some assistance the district can become a very important producer of zinc. It is desired that the ores should be smelted in Canada; but it is thought that to do this the smelter men will need to have some aid from the Government until the industry is well established.

The Department of Mines has undertaken the investigation of methods of treatment of the ores, and promises to render considerable assistance this way.

On the occasion of the visit of Hon. Louis Coderre, Minister of Mines, to Nelson on August 21, business and mining men presented their case to him and urged that a commission be appointed to investigate its merits. It is likely that this will be done.

Mr. Coderre, who is accompanying the C2 excursion of the Geological Congress, is showing a keen desire to become acquainted with the wants of the mining men of the west.

## DISORDER CONTINUES IN MICHIGAN COPPER DISTRICT

There are as yet no indications of a settlement being reached between union strikers and the mine operators of the Copper Country. A number of the mines are in operation, the miners being carefully guarded. Workers are frequently assaulted by strikers, and it is still considered unsafe to withdraw the militia. At a meeting of strikers in Laurium a resolution was made to appeal to the U. S. Senate for an investigation of the conditions. It is reported from Washington that Frank Morrison, secretary of the American Federation of Labor, has, at the request of President Moyer, issued an appeal for funds to help the strikers. The union officials complain that the operators will not recognize the union. The operators say they are willing to talk with their employees as such; but not with representatives of the union.

It is reported from Houghton that the mine output is steadily increasing. Calumet and Hecla mine is operating twelve shafts, Isle Royal one, Champion two, Timountain one, Quincy two and Superior one. The Mining Gazette reports the output last week to be at the rate of about 5,000 tons of ore per day.

Strikers complain that they have not received the benefits promised them by the agitators. Some are resigning from the union and others leaving the country. Some continue to believe the agitators.

## FOURTH EDITON OF COBALT REPORT

The Ontario Bureau of Mines has published a new and revised edition of the report on the Cobalt district, prepared by Dr. W. G. Miller, C. W. Knight, A. G. Burrows and others of the staff. The third edition, published in 1908, has been out of print for some time.

The mining operations during the past few years have disclosed many interesting structural features, and the revised report contains a number of sections illustrating these. Accompanying the report there are a number of new photographs and maps, which aid in giving the reader a better knowledge of the character of the ore bodies and the rocks in which they occur.

In addition to description of the Cobalt area proper, there are short descriptions of surrounding areas, including South Lorrain, Casey and Harris, Lake Wendigo, Bay Lake, Montreal River, Temagami Forest Reserve, Gowganda, Shining Tree, Florence Lake, Langmuir Township and Otter Township.

A chapter is devoted to the Lake Superior and other Canadian and foreign deposits of Cobalt deposits and the metallurgy of Cobalt. Mr. E. T. Corkill contributes a description of mining and concentration methods at Cobalt.

The newer features of the geological descriptions are contained in the paper by Dr. Miller, prepared for the Geological Congress, and now running in the Journal.

## AN INDEX TO THE PUBLICATIONS OF THE CANADIAN MINING INSTITUTE

Mining men will be pleased to learn that the general index to volume I. to X. of the Mining Institute Transactions is nearly ready. In addition to the index the book contains very useful summaries of the papers. The labor and expense involved in compiling the book has been very considerable, and it is hoped that members will support the effort by subscribing at an early date. The edition is a limited one.

# MOB VIOLENCE AT VANCOUVER ISLAND COAL MINES

Mob rule prevailed for two or three days about the middle of August in Nanaimo coal mining district, Vancouver Island, British Columbia, but the prompt action of the Provincial Government in despatching the militia forces in sufficiently large numbers to enforce the law and keep order, resulted in a speedy termination to the violence and excesses of the brief period during which the local and special police were powerless to prevent the outrages that occurred.

The history of the trouble goes back to the declaration of a strike of the miners then employed at the several coal mines at the Comox (Cumberland) and Extension collieries of the Canadian Collieries (Dunsmuir) Limited, owning and operating the mines acquired about two years ago from the Dunsmuir interests. After the strike was carried out, the company was unable for more than six months to operate its Extension colliery mines, which are situated a dozen or fifteen miles south-west of Nanaimo, and which have their shipping bunkers near Ladysmith, the residence town of most of the Extension miners. Efforts were concentrated during those months on the operation of the Cumberland mines, and gradually a non-union force was obtained, until latterly the mines were being worked at about three-fourths their normal productive capacity, and coal was being sent out accordingly. Having got things going at Cumberland, the company two or three months ago turned its attention to Extension mines, where, despite the boast of local strikers that work would not be resumed until after an agreement with them, it became apparent that the working force there also was gradually being increased and production of coal resumed. Meanwhile efforts had been made, but without success, to induce the men employed at the Western Fuel Company's mines, in the immediate vicinity of Nanaimo, to join in a sympathetic strike. Incidentally, it may be mentioned, that the agreement between the Western Fuel Company and its miners had still several months to run—until September—it has been stated in district newspapers. Other collieries being operated near Nanaimo were those of the Pacific Coast Coal Mines, Ltd., and the Vancouver-Nanaimo Coal Mining Company Ltd., but both these were producing on a much smaller scale than the two larger companies previously mentioned.

At the end of last April a man named Farrington, of Seattle, Washington, prominent in the activities in the North-west of the United Mine Workers of America, instructed the president of the local union at Nanaimo to call a strike at all coal mines on Vancouver Island. Notwithstanding that the U. M. W. of A. did not at that time have on its membership list one-tenth of the men concerned—island newspapers published the statement that its local membership was then only about 200—nearly 2,000 miners and other coal mine employees ceased work, many of them acknowledging that while they wished to keep faith with the company and carry out their agreement, they could not afford to be branded as "scabs," as the U. M. W. of A. was reported to have announced its determination to brand them in Canada, the United States, and Great Britain if they continued at work. A vote was ordered as to whether or not they would return to work, but heeding the warning of the U. M. W. of A. not to vote, approximately three-fourths of those affected abstained from voting. The great majority of those who did vote, however, were favourable to keeping their agreement and working until it should expire. No united action was taken, though, so the production of coal was not resumed.

A short time ago an effort was made by the Western Fuel Company and its two neighbouring companies to start work with a few men, and it was generally understood that a beginning had actually been made. This seems to have so exasperated the strikers that many of them became very violent, ordering non-union workers to leave the district, and even threatening them with death if they did not go. Finding that the law was being broken, and that the few local police were powerless to prevent disorder, the Provincial Government had a number of men sworn in as special constables and sent to Nanaimo, which action so angered the lawless strikers that they hustled the specials back on the train and steamer, and bade them depart or pay the penalty of staying with their lives. Then the gathering mob abandoned all restraint, and a reign of terror was quickly inaugurated. At Nanaimo mines little damage was done by the mob, but at the Pacific Coast Coal Mines Company's South Wellington colliery, five miles away, non-union men were violently assaulted, their lives threatened, buildings were wrecked, and even the police sent from Nanaimo were assaulted and turned back. Then the mob proceeded to Extension, where the working miners were fired on, and compelled to take refuge in the mine entry, their women and children so terrified that they fled into the surrounding bush without clothing other than what they wore, and without food, and some of them had to remain there for 36 hours. When they did return they found their homes torn down or burned, all their belongings either stolen or destroyed, and mine buildings and plant effaced by fire. In the town of Ladysmith, eight or ten miles away, police were of no avail, and strikers were so threatening in their attitude that many residents, whites as well as Chinese, got away by train as soon as possible, and left their homes and belongings to the will of the unruly crowd.

Not long, though, did mob rule prevail, for before the law-breakers knew that the Provincial Government intended sending troops, there were hundreds of militia-men in Nanaimo, having been sent up at night by steamer from Victoria, and more followed from Victoria and Vancouver during the next two days. Now disorder has been effectually checked, and the ringleaders of the mob are trying to evade arrest. Col. Hall, in charge of the militia, and police officials having obtained the names of more than a hundred of those stated to have been active in citing the mob and in taking part in its excessses. There will, doubtless, be stern measures taken to punish the leaders of the mob and all others known to have been largely responsible for the disorder and crime of the few days when the mob ran amuck.

One fatality occurred—a man was shot at the Extension mines, but whether by a striker or a non-union miner has not yet been determined, for he was in the line of fire between the attacked miners and their assailants. A particularly dastardly outrage is charged against strikers at Ladysmith, who are stated to have thrown dynamite, with a short-lighted fuse attached, into a room where several children were in bed. The story told is that the father of the children, realizing their imminent danger, seized the dynamite, but before he could throw it out of the house it exploded in his hand, shattering one of his arms and so injuring the lower part of his body that recovery is regarded as most unlikely. Other cases of brutality on the part of the strikers are alleged, but as yet investigation of them has not been made.

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# AMALGAMATION AND CYANIDATION OF COBALT SILVER ORES

By Reginald E. Hore.

Both high grade and low grade ores are now being treated by amalgamation in some plants at Cobalt, and low grade ore is being cyanided. At the Nipissing the process for treating the high grade has proven quite successful, and a similar plant has been built at the Buffalo. Amalgamation of concentrates from low grade ore is used at the Nova Scotia mill. Cyaniding is extensively used at the O'Brien and Nova Scotia plants. At the Buffalo. slimes are cyanided, and at the Nipissing high grade mill, tails from amalgamation treatment are cyanided and the Nipissing has recently put into operation a large cyanide plant for the treatment of low grade ore.

Nipissing low-grade plant.

Nipissing high-grade plant.

## High Grade Plants.

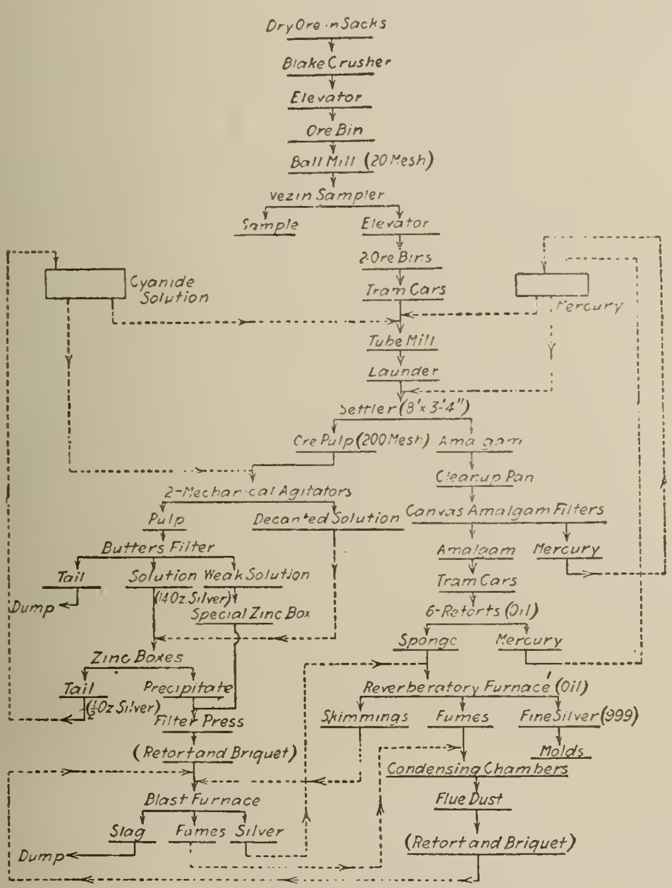
To treat high grade ore on the property without smelting it, the Nipissing management has a very satisfactory process which was worked out by Charles Butters and his assistant, G. H. Clevenger. The crushed ore is ground with mercury in a tube mill. The amalgam sponge is melted in a reverberatory furnace and refined. The tails from the tube mill are cyanided. The precipitates are melted in a tilting furnace and refined in the reverberatory.

The Nipissing high grade mill has been described by Mr. T. A. Rickard in the June, 1912, number of the Mining Magazine, and I quote here his description and comments:

"The ore after being crushed to 70 mesh at the sampler is delivered to the plant with an average content of 2,600 oz. silver per ton. It is fed to a Krupp tube-mill 20 feet long by 4 feet diameter. The charge consists of 3½ tons of ore, 4½ tons of mercury, and a 5% cyanide solution. The tube-mill is closed at both ends. Air, to accelerate chemical action, is introduced through a pipe. There is also an ingenious device whereby the excess of air is subsequently expelled. After nine hours in the tube-mill, 98% of the silver has been extracted from the ore, which in the form of pulp, then passes to a settler, where the amalgam is separated by gravity. Thence it goes to a clean-up pan and drainers. These last are canvas bags for removing any excess of mercury. Meanwhile the pulp and solution, deprived of amalgam, passes to a vat and is fed to a Butters filter, the clarified solution going to boxes in which the dissolved silver is precipitated by zinc shaving. This shaving is in the form of a coarse wire, necessary on account of the strength of the cyanide solution. The residue, left on the filter, is stored, being valuable for its arsenic, nickel and cobalt. As yet no method has been devised for eliminating the arsenic in this residue with a view to marketing the nickel and cobalt.

"Meanwhile the amalgam, containing 80% mercury and 20% silver, is placed in retorts, each of which holds 450 lbs. After the mercury has been distilled, the silver, still containing 1% mercury, is taken to a reverberatory furnace. Here it is melted in a charge of 25,000 ounces. After 15 hours' exposure to a hot oxidizing atmosphere, without addition of any flux, the molten metal is cast in ingots, each weighing 1,100 oz. silver, which is 999 fine. Two oil-burners furnish the necessary heat. The flue from the furnace is provided with a water-jet condenser, whereby 1,000 to 2,000 lbs. mercury is arrested monthly. The gases escape at 100 degrees F. While I was collecting these data a melt was about to be finished, and I was able to see the bath of molten metal before it was tapped into the rows of ingots. During February 550,000 ounces of silver were melted in this small plant.

"The richness of the mine product under treatment and the completeness of the metallurgical operations left a vivid impression. Within a small building it was possible to watch the successive stages by which a complex ore of a refractory type yielded its precious content in metal of such purity as to be ready for the mint. The entire process is so expeditious that the silver is delivered at New York within a week of the day when the ore is received at the mill and a cheque for the yield is received concurrently with the shipment. No less than 20 tons of mercury is in use at a given time. The cyanide has a cleansing effect upon it; indeed, the use of mercury would be impracticable without the cyanide, for the mercury would become 'sick' or fouled so as to hinder amalgamation with the silver in the finely ground arsenical ore. The yoking of amalgamation and cyanidation constitutes another remarkable feature. To the practical man, however, the most memorable note is the fact that a consignment of ore is turned into negotiable paper within seven days."




**Flow sheet, Nipissing high-grade plant.**

A more recent article by Mr. R. B. Watson, general manager, Nipissing Mining Co., in December, 1912, issue of the Engineering and Mining Journal, gives further information. Mr. Watson says:

"The high-grade ore from the picking tables is delivered to the sampling plant at the top of the mill where it is put through a 9 x 15-inch Blake crusher and elevated to a steel receiving bin. From this it is fed automatically into a No. 3 6-foot Krupp ball mill carrying 1,000 pounds of steel balls and fitted with 20-mesh screens. The metallics or silver nuggets which will not pass the screen are removed periodically by taking off a screen, and are melted down in the refinery. From the ball mill the pulp is delivered by a spiral feed to a Vezin sampler and elevated to two 60-ton steel storage tanks, from which it is drawn as needed for treatment in the mill.

"The main operation consists of amalgamating the silver in a 5 per cent. cyanide solution while the 20-mesh material is being ground in a tube mill. The mill used is a Krupp mill 3 feet 11 inches in diameter and 19 feet 8 inches long, fitted with silex liners and run at 37 r.p.m. The weight of ore per charge depends somewhat on the silver content, but with 2,500-oz. ore the ordinary tube-mill charge is 6,500 lb. of ore; 8,500 lb. of mercury; 3,800 lb. of cyanide solution, and six tons of pebbles.

"The materials are charged through a manhole on the top of the mill, and after the cover has been replaced the mill is revolved for 9½ hr., when 99 per cent. of the pulp will pass a 200-mesh screen. This fine grinding is necessary to liberate the fine particles of silver and permit of complete amalgamation. A screen analysis of the final tailing shows that the coarser particles are much richer than the slime; this is also shown by the accompanying screen tests on ore crushed through a 10-mesh screen.

"It was found advantageous to have a certain quantity of silver go into solution in the cyanide, and to this end more air had to be supplied to the charge.

"Each gudgeon of the mill is fitted with a stuffing box through which passes a heavy cast-iron pipe, four inches outside diameter, with a 1½-inch hole through the centre. The casting is held stationary by bolts to the concrete foundation, and the mill revolves about

**Grading Analysis of Nipissing Ore Crushed Through 10-Mesh.**

| Mesh. | Percentage by weight. | Silver oz. per ton. |
|---|---|---|
| + 20 | 12.7 | 6837 |
| + 40 | 26.2 | 3375 |
| + 60 | 11.6 | 2330 |
| + 80 | 6.3 | 1954 |
| + 100 | 6.3 | 1654 |
| + 120 | 2.7 | 1348 |
| + 150 | 1.3 | 1182 |
| + 200 | 3.8 | 1202 |
| — 200 | 29.1 | 706 |

the pipe. Compressed air under 25 lb. pressure is introduced through one of the hollow castings. At the outlet end there is a right-angle turn in the holow casting just inside the mill and the upper end reaches to within ½ inch of the lining. The heavy cast-iron elbow, therefore, remains stationary, the inside leg stands vertical, and the upper end remains above the level of the charge at all times, allowing the compressed air to escape while the mill is in motion. The casting is heavy enough to withstand the battering of the pebbles falling against it. This arrangement allows the mill to be filled well above the centre with a consequent decrease in the power used, but it is found that the best results are obtained by filling the mill to a point two inches above the centre.

"At the end of the grinding period the three manhole covers are replaced by coarse screens and the mill is turned over; the charge falls into a sheet-iron hopper which delivers it into an all-iron settler, eight feet in diameter, fitted with wooden shoes. The tube mill is then washed out twice by revolving it with a ton of solution and 1,500 lb. of mercury. These washes are added to the charge and the settler filled with solution; the charge is kept in agitation by the muller while the amalgam is drawn off into an iron cleanup pan, and from there into canvas amalgam filters, of which there are 24, each holding 400 lb. of amalgam. The pulp is gradually run out of the settler by drawing the top plug, the balance of the charge being washed twice with solution.

General view in Nipissing low-grade plant, during construction.

Building one of the huge tanks.

When the flow of amalgam has ceased, the mercury, as it drains out of the canvas filters, is pumped back to the settler to wash out any remaining amalgam. The bottom plug is finally drawn and the balance of the pulp discharged. It requires two hours to dump the charge and get the amalgam into the filters.

"It was soon found that the amalgam must be kept exceedingly thin, otherwise it would stick in the tube mill and cake under the muller of the settler; hence the mercury used is 15 times the weight of the silver in the ore. After draining in the sacks, the amalgam still carries 78 per cent. mercury. The remarkable part about the whole process is that 97 per cent. to 80 per cent. of the total silver in the ore yields to amalgamation in the tube mill. An ore assaying 2,500 oz. per ton is reduced to 50 to 75 oz. per ton when it leaves the settler.

"The cyanide treatment of the pulp which follows is comparatively unimportant as it deals only with six or seven tons of 50-oz. ore daily. There are four 16 x 7-foot wooden tanks for the collection and treatment of the pulp, and the necessary tanks for storage of solution and water. A charge for agitation is made up of four tube-mill charges or 13 tons of dry pulp. Five pounds of lime per dry ton of pulp are added and the charge is agitated for 36 hr.; the tanks are fitted with mechanical agitators, and the pulp is circulated through a pump as well. The cyanide strength is 0.75 per cent.

"After settling, the solution is decanted, and the pulp, having a specific gravity of 2, is run to a Butters filter of 10 leaves. The specific gravity of the ore is 6, and to avoid the settling of the pulp in the bottom of the filter box while the cake is forming, the charge is kept in circulation by an air lift drawing out of the bottom of the box and delivering at the top. The cake is washed 2½ hr. with weak solution and then discharged. The arsenides of cobalt and nickel go through the process practically unchanged; the residue for the first seven months of this year contained 9 per cent. of cobalt and 4.5 per cent. nickel."

### Buffalo High Grade Plant.

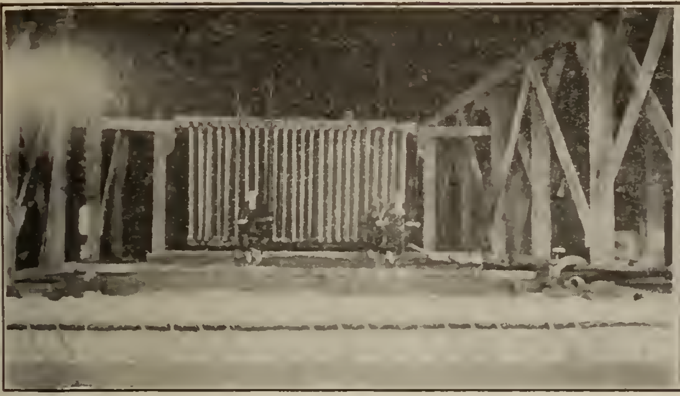
Mr. A. A. Cole, in his report for 1912 to the T. and N. O. Ry. Commission, describes the new high grade plant at the Buffalo as follows:

"During the summer the Buffalo mines erected a mill for the treatment of their high grade ore and concentrates, and the mill commenced operations at the end of November. The method of treatment adopted is very similar to that already in operation at the Nipissing high grade mill.

"The ore is hoisted up an incline from the low grade mill, and discharged into bins near the top of the high grade mill. The ore is first dried and then ground in a Krupp ball mill through a 30 mesh screen, the metallics from the same being separated during the grinding and sent separately to the tilting furnace. After weighing and sampling, the ore is charged into a 5½ ft. x 20 ft. tube mill. The charge consists of five tons of ore, with an equal weight of mercury, with a 40 per cent. moisture of a 5 per cent. cyanide solution. The tube mill is run until the entire charge will pass 200 mesh, or from 9 to 10 hours. The charge then passes to an 8 ft. all iron settler, from which the mercury is drawn off to a 4 ft. clean-up pan. The mercury containing the silver amalgam is strained in 18 canvas bags, the mercury passing through and returning to the mercury reservoir and the amalgam being taken to the refinery. The ore pulp from the settler, along with the overflow from the clean-up pan is passed into a secondary settler for further recovery of the floured mercury. The overflow from this last settler is run to an elevator and elevated to agitation tanks. These are

Zinc boxes, Buffalo cyanide plant.

Tube mills, Nipissing low-grade plant.



Moore filter, O'Brien cyanide plant.

Filters, Buffalo cyanide plant.

of the Parral type, three in number, 10 ft. in diameter by 12 ft. high. After sufficient agitation the pulp is drawn off to a 30 ft. Burt revolving filter. The strong solution is filtered into a sump and pumped to a sand filter tank, whence it is drawn off by gravity to the strong solution zinc box. The overflow from the zinc box flows by gravity to the strong solution sump, and from there it is elevated by a 2 inch centrifugal pump to the top of the mill to a tank 9 ft. diameter by 9 ft. high. It is then used in the next tube-mill charge. Air is used to drive out the remainder of the strong solution in the Burt filter. A weak solution is then added, followed by a water wash and the cake dried by air. On lowering the pressure in the Burt filter the cake drops off and is wound out by means of an angle iron on the inside acting as a screw conveyor. The cake falls on a 14 inch conveyor belt and is conveyed to a 60 ft. square concrete bin outside the mill.

"The pulp in the agitators, after sufficient agitation, is allowed to settle and the clear solution is drawn off by means of a floating siphon to a clarifying press, and thence to the storage tanks at the head of the zinc boxes. Coarse zinc shavings are used to precipitate the dissolved silver. The zinc box precipitates are drawn off into a box with a screen to prevent the escape of any short zinc, and are then pumped into an 18 inch square frame precipitating press, by a 5 in. x 5 in. Aldrich ball valve pump. The solution is returned to the barren solution sump. Air is admitted to the press at 100 pounds pressure, and the cake after washing and drying is carried to the retorts furnace, where it is retorted for mercury recovery. It is then charged into the tilting furnace.

"In the refinery the amalgam is charged into four retorts, 14 in. x 60 in., holding 1,000 pounds to a charge. The mercury fumes are condensed and returned to the boot of the mercury elevator. The retorted silver is charged into a refining furnace with a capacity of 30,000 ounces per charge. This furnace also received the silver from the tilting furnace.

"The retort, tilting and refining furnaces are all connected with a three compartment dust chamber, 15 ft. long. One of these compartments contains a coil for heating the air supplied to the refining furnace.

"The fumes are carried through a 30 inch pipe containing three water sprays. This pipe is 100 ft. long, and drains to a box in which there is a baffle to prevent the escape of the fumes. This box also serves as a mercury trap. A Buffalo Forge Company suction draft fan, with a 24 inch square outlet, is placed at the end of the 30 inch pipe, and this discharges directly into a 35 ft. stack, 34 inches in diameter.

"A well equipped laboratory with a competent chemist in attendance is at hand for mercury, silver, cobalt, nickel, and other determinations that are necessary.

"By the 31st of December, 1912, this mill had treated 105 tons of concentrates, along with metallics, precipitates and re-smelted bullion, producing 205,302 ounces of fine silver bullion."

### Low Grade Cyanide Plants.

The plants that are treating low grade ore in most cases use straight concentration methods; but cyanide is used at the Buffalo, O'Brien, Nova Scotia, and the new Nipissing plant. At the O'Brien all fines are cyanided. At the Nova Scotia cyanidation is secondary to amalgamation. At the Buffalo only slimes from the tables are treated and the only silver recovered is that which cannot be readily saved by straight concentration.

### The O'Brien Plant.

At the O'Brien the ore is brought from the shaft houses to the mill by electric tram. It is weighed and then crushed to pass 1½ inches. The ore is hand picked as it is fed to the crusher. The crushed ore is classified into four sizes by a trommel. The over ¾-inch goes to the Harz jig. Under ¾-inch and over ½-inch to a Richards jig, and under ½-inch to a second Richards jig. All under ⅛-inch goes directly to the stamp bin, where it joins tails and middlings from the jigs.

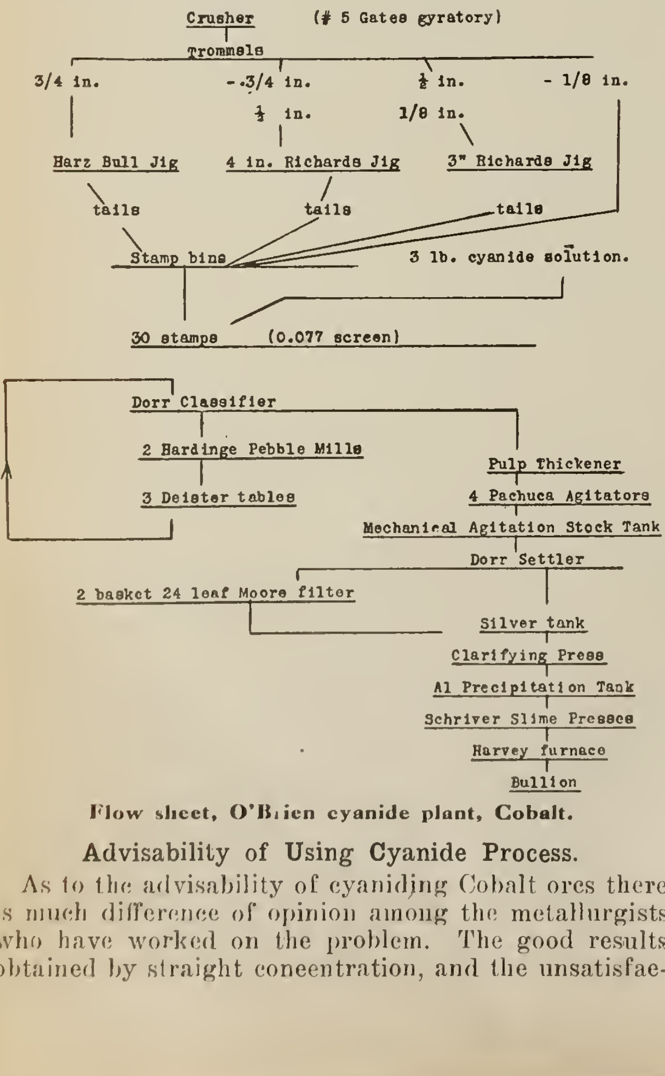
The three jigs together produce about 20 per cent. of the total mill recovery of silver. Most of it is recovered on the Harz bull jig.

The ore is stamped in a 2½-pound cyanide solution to pass a screen with 0.077 inch opening. The pulp is classified in a Dorr classifier and about 70 per cent. of it is reground in Hardinge pebble mills. The reground sand from the Hardinge mills is passed over three Deister tables and about 40 per cent. of the total silver recovery is made here. The tails from the tables are returned to the Dorr classifier. The overflow of the Dorr classifier, of which 80 per cent. is 200-mesh, passes to a 30 ft. Dorr settler.

The slimes, after settling, are pumped to Pachuca agitators where the cyanide solution is made up to five pounds. After agitating forty-eight hours the pulp is filtered in a 2-basket, 24-leaf Moore filter. The solution passes to a clarifying press and thence to the precipitating tank. Here it is stirred for one-half hour with an excess of aluminum dust. This metal is more costly than zinc, but less of it is necessary. It gives a high-grade bullion and regenerates the cyanide combined with the metals to be precipitated. This metal, while more costly than zinc, gives a higher grade product and so decreases refining costs. The O'Brien bullion is over 980, while the bullion as produced by zinc precipitation is commonly under 950 fine. The precipitate is melted without any flux in a Harvey furnace and the resulting bullion is shipped to London. The chief impurity is said to be copper.

Regarding the use of aluminium as a precipitant, Mr. S. F. Kirkpatrick, in the June issue of the Engineering and Mining Journal, says in part: Up to the present, excluding the Nipissing bullion, over 14,000,000 ounces of silver have been precipitated by aluminium from cyanide solutions. Most of this has been recovered by the Deloro Mining and Reduction Company, through the cyanidation of Cobalt high grade ores or speiss produced from these ores, and a minor portion by the O'Brien mill, treating low grade Cobalt ores. Describing the process of precipitation, Mr. Kirkpatrick says: "An amount of aluminium dust, slightly greater than one-eighth of the weight of silver present, is added (to the solution to be precipitated), with about one-half the weight of caustic soda." There is a discrepancy between the theoretical amounts required for the supposed reaction and the amounts actually employed. Mr. Kirkpatrick suggests that this might be accounted for by a partial precipitation according to reactions suggested by Mr. Hamilton in an article describing the use of aluminium at the Nipissing plant, or by loss due to the action of soda and water on the aluminium, or by incomplete solution of the aluminium due to fine particles being coated with silver. The amount of soda required varies with the acidity of the ore treated. Mr. Kirkpatrick gives the cost of chemicals for precipitating 1,000 ounces of silver as follows: 35.6 lb. soda, at 2 cents per lb., $712, and 9.1 lb. aluminium, at 32 cents per lb., $2.91; total, $3,622.

The process at the O'Brien is shown in outline by the accompanying flow sheet.




**Flow sheet, O'Brien cyanide plant, Cobalt.**

## Advisability of Using Cyanide Process.

As to the advisability of cyaniding Cobalt ores there is much difference of opinion among the metallurgists who have worked on the problem. The good results obtained by straight concentration, and the unsatisfactory results of some experiments in cyaniding, lead several mill men to conclude that results obtained by present methods do not warrant the buidling of cyanide plants. Other metallurgists, who believe that straight concentration should be the main process, are in favour of cyanide treatment of the slime tails from the concentrating tables. Still others consider the cyanide process so satisfactory that they have devised plants in which the chief recovery from low grade ore is by cyanide.

**Harvey melting furnace, O'Brien cyanide plant.**

There are differences in the ore from the several mines. Some produce ore containing a greater percentage of cyanicides than do others. The ore in diabase, for instance, is comparatively clean and easy to treat. Of the ore in conglomerate, some contains considerable ruby silver, while ore from other mines or other parts of the same mine is comparatively free of such compounds. Dyscrasite, which occurs in a few rich veins, destroys large quantities of cyanide. It is stated that copper is present in some ore in sufficient quantity to be an important cyanicide; but other ore is almost free from copper compounds. The character of the ore, therefore, is responsible for some of the differences of opinion among the millmen. Variations in the results obtained in straight concentration plants are also responsible.

The new plant built for the Nipissing Mining Company provides for extensive use of cyanide, and it is therefore apparent, that while most of the millmen prefer straight concentration, there are others, who, after much experience with the ores, believe in the cyanide treatment.

# THE MOOSE MOUNTAIN IRON RANGE*

By A. P. Coleman.

At Moose Mountain about 7 miles beyond the northern side of the nickel basin, and 33 miles from Sudbury by the Canadian Northern Railway, one of the largest iron ore deposits in Canada has been found. The iron formation here is separated from the northern nickel range by a band of Laurentian consisting of granite, banded gneiss, greenstone and green schist, all more or less cut by pegmatite dikes. These rocks are far older than the nickel eruptive and underlie the deposits of the northern nickel range as country rock. The Sudbury series is lacking on this side of the nickel basin, so far as known, and nothing suggesting the Grenville series has been found, so that the geology to the north differs greatly from that to the south.

Moose Mountain, rising 280 feet above the plain and the railway, though one of the most important examples of the iron formation in the Keewatin of Ontario, presents less than the usual variety in the accompanying rocks, and the structural relations are more obscure than in some other regions, such as the Helen Iron Range.

In most cases the iron formation of Ontario consists of some form of silica interbanded with iron ore, either jasper with hematite or cherty or quartzitic silica with magnetite. At Moose Mountain the latter material is found. Commonly the iron formation occurs as synclinal belts enclosed in green Keewatin schist; but a definite relation of this sort has not yet been proved at Moose Mountain, perhaps because the regularity has been disturbed by intrusions of greenstone and granite. The accompanying rock is a banded schist alternately light and dark gray. The iron formation here has the usual steeply tilted attitude. Often the banding is fairly straight and uniform for considerable distances, but in many cases there has been crumpling and sometimes crushing and faulting on a small scale. The ordinary banded ore contains 36 per cent. of iron, and from the results of stripping and diamond drilling, the manager of the mine, Mr. F. A. Jordan, estimates that there are 100,000,000 tons of ore of this grade. There are also 6,000,000 tons of higher grade magnetite in which there is much less silica and where the banding is less marked. Here some green hornblende is interbedded with the magnetite.

Laurentian-looking gneiss occurs just south of the iron formation, but its relations to the ore bodies are not very certain; though dikes of granite and less often pegmatite cutting some of the outcrops of ore have probably come from it.

The richer parts of the ore have been greatly fissured and are penetrated in all directions by yellowish green bands or veins of epidote, evidently the last mineral formed. Beside these bands the magnetite is sometimes changed to hornblende which gradually passes into the usual ore within a few inches. The main ore body worked has been provisionally classified by Prof. Leith as belonging to the Pegmatitic type (Jour. Can. Min. Inst., Vol. XI., 1908, p. 93). He defines the type as including "ores which are carried to or near the surface in magmas and are extended from them in the manner of pegmatite dikes, after the remainder of the magma has been partially cooled and crystallized. They are deposited from essentially aqueous solutions mixed in varying proportions with solutions of quartz and the silicates." He has evidently in mind the usual theory of the formation of the Kiruna and other magnetite deposits in northern Sweden. In his special reference to the Moose Mountain deposit, he mentions that the ore shows "such intimate relations with greenstones as to suggest a direct derivation from them."

It should be stated, however, that some of this richer ore is interbanded with belts of the poorer silicious type making up the majority of the whole series of deposits, and it is possible that the downward percolation of hot waters may have produced the enrichment. The latest effect of circulating fluids, the formation of epidote, is generally accompanied by an enrichment of the ore near the small veins of that mineral.

Moose Mountain has been the first iron mine in Canada to concentrate its ores magnetically on a commercial scale. The higher grade ore is crushed to about inch size and separated from the intermixed epidote and hornblende by magnetic means, raising its iron contents to a merchantable grade containing 55.50 per cent. of metallic iron. The plant in use, though small and experimental, has provided 155,000 tons of ore for shipment.

This method is not effective for the 36 per cent. ore in which the magnetite is intimately mixed with silica, and within the past two years a new concentrating mill, much larger and more elaborate, has been erected. Here the ore is crushed to 100 mesh and separated magnetically by the Grondal method. The finely divided magnetite is then compressed to drive off most of the water, briquetted and finally treated in a furnace which sinters it slightly and transforms most of the magnetite into hematite.

Though not so large as the great magnetite deposits at Kiruna and elsewhere in northern Sweden, Moose Mountain promises to become a great producer of ore. The Keewatin iron deposits of Ontario, with the exception of the Helen and Magpie Iron Mines near Lake Superior, are usually similar to the one just described at Moose Mountain. There is a good deal of dispute as to their origin, though the original materials of the iron ranges are admitted by all to have been sediments of some kind.

*Extracts from Guide Book No. 7, published by Geological Survey of Canada for Twelfth International Geological Congress.

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## HALF YEAR IN COPPER.

According to the Boston News Bureau, the half year to June 30 witnessed the breaking of all records concerning copper exports, the total clearances being 193,936 tons, against 172,441 tons in the first six months of 1912.

Prices have ranged between 17¾ cents and 14⅜ cents. Early in the year a few sales of electrolytic were made at the top figure just before the break, and in the ensuing downward movement the metal sold as low as 14½ cents a pound.

A recovery then took place about the middle of March, during which electrolytic sold up to 15.96 cents a pound, following which another quiet spell brought cheap sellers into the market, and their offerings resulted in sales down to 14⅜ cents, cash, New York.

# THE COBALT AREA

By Willet G. Miller.

(Continued from August 15th issue.)

### The Cobalt Silver Veins.

The cobalt-silver veins occupy narrow, practically vertical fissures or joint-like cracks in rocks of three ages, viz.: Cobalt series, Keewatin series and Nipissing diabase. The relations of the veins to each of these three groups of rocks are shown in the accompanying generalized cross-section of the Cobalt area and in the larger scale, coloured cross-section (plate IV.), published by the Ontario Bureau of Mines. The veins are much more numerous in the rocks of the Cobalt series than in the Keewatin or Nipissing diabase.

It was estimated that up to July 1st, 1911, the yield from the Nipissing diabase had been approximately 7.55 million ounces from 12 veins, or 629,000 per vein, or 7 per cent. of the total production. The Keewatin, with 13 veins, had produced 11.7 million ounces, or nearly one million per vein, or 10.85 per cent. of the total. From 86 veins in the Cobalt series there had been obtained 88.55 million ounces, or a little over one million ounces per vein, representing 82 per cent. of the total production. It is difficult to determine the exact number of productive veins owing to the fact that, being very narrow, parts of one vein may be mistaken for two or more distinct veins. At the present time there are 115 or more productive veins, and the relative productivity of those in the three series of rocks is about the same as it was in 1911.

### Origin of the Veins.

After the intrusion of the Nipissing diabase sill, which, on the whole, dips at a low angle from the horizontal, and penetrates both the Cobalt series and the Keewatin, disturbance, probably due chiefly to the contraction of the sill on cooling, caused fissures and joint-like cracks to be formed. These openings were made in the rocks of the hanging wall of the sill, in those of the foot-wall, and in the sill itself.

Ore-bearing waters working through or along the zone of weakness produced by the sill deposited their burden in the fissures and cracks. The minerals first to be deposited were essentially cobalt-nickel arsenides, and related compounds, and dolomite or pink spar. The fissures and cracks were ultimately filled with these minerals. Then there was a slight disturbance of the veins, reopening the ore-filled fissures and cracks, or fracturing the material deposited in them.

In the interval, between the filling of the fissures and cracks with cobalt-nickel ores and the fracturing of the veins thus formed by a secondary disturbance, the character of the material carried by the circulating waters had changed. Silver was then the characteristic metal in solution, and it was deposited, along with calcite, in the cracks and openings in the fractured veins. There may have been some silver deposited in the earlier period of vein filling, and doubtless cobalt-nickel minerals were deposited after the secondary disturbance, but the latter minerals belong characteristically to the first generation and the silver minerals to the second.

Certain writers on the Cobalt ores have expressed the opinion that the silver represents "secondary enrichment," meaning that it has come from the decomposition of compounds of the metal in the veins that were deposits at approximately the same time as the cobalt-nickel minerals. The present writer believes that at least by far the greater part of the native silver is of primary origin. The recent interesting experiments of Messrs. Chase Palmer and Edson S. Bastin,* on the precipitation of silver from solutions by cobalt-nickel minerals, appear to confirm the opinion that the native silver is a primary deposit, and did not come from the decomposition of silver compounds in the veins. The work of these gentlemen shows that where silver solutions come in contact with cobalt-nickel minerals the silver is deposited rapidly and essentially as native silver. Since there is much calcite in the veins with the native silver, it would appear that the metal was carried in solution as a carbonate, or double carbonate. Under ordinary conditions of temperature and pressure, silver carbonate is slightly soluble in water. For example, sufficient of the carbonate can be dissolved in an ordinary beaker of water to make a distinct precipitate of metallic silver when cobalt-nickel minerals are placed in the beaker.

It has been proved, by the experience gained in mining at Cobalt, that the presence of rich silver ore is dependent on proximity to the diabase sill. Over much of the productive area, not only the upper wall of the sill, but the sill itself, and more or less of its foot-wall have been removed by erosive agencies. Owing to little of the upper or hanging wall remaining in the productive area, most of the ore has come from the foot-wall of the sill, or from what was the foot-wall before the erosion took place. In these veins, in the foot-wall of the sill, it is the exception to find rich silver ore extending more than two or three hundred feet below the surface. Most veins are productive to a lesser depth. After rich silver ore disappears, with increase in depth, cobalt-nickel ore frequently continues downward in the veins. This seems to be due chiefly to the strong precipitating effects that the cobalt-nickel minerals had on the silver in the waters that worked downward beneath or along the sill. The silver was deposited before it reached a great depth. In certain cases, where veins with cobalt-nickel minerals contain no rich silver ore, or in which the silver extends to a comparatively shallow depth, the absence of the precious metal is to be accounted for by the fact that such veins, or parts of veins, escaped fracturing during the secondary disturbance, thus not affording openings for deposition from the silver-bearing solutions.

Frequently, below the rich silver-bearing parts of veins well crystallized argentite and hair silver are found in vugs. These minerals may represent secondary deposition of a little of the silver that has been dissolved from the upper part of the veins and carried downward.

### Former Vertical Extension of Veins.

Certain writers have expressed the opinion that veins of the Cobalt area, that outcrop at the surface or occur immediately below the drift covering, represent the narrower, lower parts of wider veins that extended to or towards the original surface. There is no justifica-

*Ec. Geology, March, 1913.

tion for the holding of such an opinion. The few veins that have been worked to a depth of a few hundred feet in rock of one series give no indication of becoming narrower below, although, when the veins are in the foot-wall of the sill, the ore tends to become less rich as the vertical distance below the sill or the eroded part of it becomes greater. Moreover, "blind" veins, or those which do not reach the present surface of the rock, have been found. These veins have the same character, as regards width and mineral content, as those which are exposed at the surface.

Briefly, it appears that after the intrusion of the diabase, fissures and cracks were formed in the rocks of the hanging wall and in those of its foot-wall, and in the sill itself. The openings in the upper wall probably extended a considerable distance upward beyond the sill, but there is no evidence that they reached the surface or that they were wider in the parts that have been eroded.

Some of these fissures in the upper wall extended downward into the sill itself, e.g., veins on the Timiskaming, Beaver and Nova Scotia. The veins on these properties, worked at the surface in the Keewatin hanging wall, and in the diabase sill below, are the deepest mines in the area. No foot-wall vein has been found to be productive to such a depth.

Then there are veins, e.g., that on the Cobalt Central property, which have been worked at the surface in the diabase and followed downward into conglomerate and greywacke, which at times lie beneath the sill.

Again, blind veins are found in the Cobalt series and in the Keewatin where the sill has been eroded.

There are also blind veins, e.g., one that was worked two or three years ago under Peterson Lake and one on the Silver Leaf property, that lie in Keewatin beneath the sill. These veins run upwards to the lower face of the sill, but not into it.

The types of veins mentioned in the preceding paragraphs are shown in the accompanying, generalized cross-section of the area.

### Relation of Wall Rock to Ore.

The productive veins, as the maps and cross-sections show, are found in three series of rocks, viz., the conglomerate and other sediments of the Cobalt series, the Nipissing diabase sill, and the Keewatin complex. But 80 per cent. or more of the ore has come from the Cobalt series. The chief reason for this greater productiveness is due to the fact that these rocks fractured more readily than did the diabase or the Keewatin. There appears to have been no difference in the precipitation of ores due to physical-chemical influences of the country rocks. Precipitation seems to have taken place as readily in rocks of any one of the three series mentioned in the preceding paragraph as in the others.

Judging from the way in which silver is found in the minutest cracks in granite boulders of some of the conglomerate near the veins, this ore, at least, was precipitated no less readily in acidic rocks than in basic ones. With the exception of these boulders, there are few opportunities afforded of observing the relations of the ore to granite. But in the Timiskaming mine, a few hundred feet below the surface, narrow dikes of Lorrain granite intrude the Keewatin and are cut across by a vein. The surface of the granite is plated with native silver.

The occurrence of rich silver ore depends on the character of the openings in the rocks now occupied by the veins, on whether the veins have been affected by secondary disturbances, and on the proximity of the openings to the diabase sill. Naturally, it would be expected that solutions would work upward through the openings in the hanging wall above the sill more readily than downward into the foot-wall. Unfortunately, owing to the excessive erosions to which the district has been subjected, there is little of the hanging wall of the sill left in the productive area at Cobalt. But of the veins thus far worked the two or three that occur in the hanging wall are productive to the greatest depth reached in the area.

In the foot-wall of the sill, or what was the foot-wall before erosion took place, the rich or merchantable ore is limited as to the depth to which it extends. This depth below the sill is variable, depending on the character and strength of the fissures, and other factors already mentioned. Rich ore descends to a less depth in narrow, more irregular fissures than in wide ones.

As has been said previously, much the greater part of the ore has come from veins in the fragmental rocks of the Cobalt series in the foot-wall of the sill. These veins, on reaching the contact of the Cobalt series with the underlying Keewatin, either end at the contact, or split into stringers, or continue down into the Keewatin. In many cases the rich ore disappears when the veins penetrate the Keewatin. On the other hand, a few veins in stronger fissures have been found to be productive in the Keewatin that, before erosion, lay beneath the sill.

In the veins both in the diabase and Keewatin rocks, ore is found to occur more irregularly distributed than in those of the Cobalt series. In other words, it tends to occur in bunches.

The best veins that have been worked in the diabase are one on the Kerr Lake property and one on the O'Brien. Of those in the foot-wall of the sill, the best vein in the Keewatin has been No. 26 on the Nipissing.

### Ores and Minerals.

The more important ores in the veins under consideration are native silver—associated with which is usually some dyscrasite, argentite, pyrargyrite and other compounds of the metal—smaltite, niccolite and related minerals. Many of the minerals occur mixed in the ores, and for this reason some of them have not been clearly identified. Another character of the minerals, which renders their identification difficult, is the fact that most of them occur in the massive form. Crystals when present are small, being frequently almost microscopic in size. The following minerals have been identified and can be conveniently classed under the headings:

1.—Native Elements:
   Native silver, native bismuth, graphite.

2.—Arsenides:
   Niccolite, or arsenide of nickel, $NiAs$; chloanthite, or diarsenide of nickel, $NiAs_2$; smaltite, or diarsenide of cobalt, $CoAs_2$.

3.—Arsenates:
   Erythrite, or cobalt bloom, $Co_3As_2O_8+8H_2O$; and annabergite, or nickel bloom, $Ni_3As_2O_8+8H_2O$; scorodite, $FeAsO_4+2H_2O$.

4.—Sulphides:
   Argentite, or silver sulphide, $Ag_2S$; millerite, or nickel sulphide, $NiS$; argyropyrite? stromeyerite? $(Ag, Cu)_2S$; bornite, $Cu_5FeS_4$; chalcopyrite, $CuFeS_2$; sphalerite, $ZnS$; galena, $PbS$; pyrite, $FeS_2$.

5—Sulpharsenides:
   Mispickel, or sulph-arsenide of iron, $FeAsS$; Cobaltite, or sulph-arsenide of cobalt, $CoAsS$.

6.—Sulpharsenites:
   Proustite, or light red silver ore, $Ag_3AsS_3$; xanthoconite? $Ag_3AsS_4$.

7.—Antimonides:
Dyscrasite, or silver antimonide, $AG_6Sb$; breithauptite, NiSb.

8.—Sulphantimonites:
Pyrargyrite, or dark red silver ore, $Ag_3SbS_3$; stephanite, $Ag_5 SbS_4$; polybaisite? $Ag_9 SbS_6$; tetrahedrite, or sulph-antimonite of copper, $Cu_8Sb_2S_7$; freibergite? (silver-bearing tetrahedrite).

9.—Sulphobismuthites:
Matildite, $AgBiS_2$; emplectite, $CuBiS_2$.

10.—Mercury:
Amalgam?

11.—Phosphate:
Apatite.

12—Oxides:
Asbolite; heubachite?; heterogenite?; arsenolite; roselite?

13.—Veinstones:
Calcite, dolomite, aragonite, quartz, barite, fluorite.

The table contains a few minerals that have been found in only one or two veins and cannot be considered characteristic. Millerite, for instance, is of rare occurrence, and emplectite has been found only in the Floyd mine, near Sharp lake, in the western part of the Cobalt area. Bornite, chalcopyrite, zinc blende, galena and pyrite are not characteristic of most of the ore, these minerals occurring more frequently in the wall rock or in non-silver bearing ore of the Keewatin, but one or two mines have produced copper with cobalt-silver ore. Apatite in recognizable crystals has been found in the ore of only one mine. Mercury appears to occur in the ore of all the mines that contain high values in silver, but whether it occurs only as amalgam or in other forms has not been determined. Among the veinstones, aragonite is found but rarely, at least in easily recognizable form, while barite and fluorite have not been observed in the veins at Cobalt proper.

A question mark has been placed after the names of several minerals in the table which have been reported to occur in the veins, but the identification of which has not been made complete by chemical analyses or crystallographic measurements.

Gold in small quantity has been found in a number of veins, especially in those in which cobaltite or mispickel are characteristic minerals.

A characteristic of the group is the subordinate part which sulphur plays in comparison with arsenic. Antimony, which is not abundant, is found in some compounds where one would expect to find arsenic, since the latter is so much more abundant. For instance, while both native silver and arsenides occur in abundance, the compounds of arsenic and silver are found only in small quantity. Then one would also expect to find more compounds of bismuth since this metal occurs in the free state in considerable quantities in some parts of the deposits. It might also be expected that native arsenic would occur at times.

Nearly all the chemical groups of minerals found in the celebrated Joachimsthal deposits of Bohemia are present in the Timiskaming ores. The most important exception is uraninite or pitchblende, which came into prominence a few years ago on account of its being the chief source of the element radium.

**Order of Deposition of Minerals.**

The following table shows, in descending order from the youngest to the oldest, the general succession in the order of deposition of the principal minerals of the Cobalt area proper. There appear to be, however, minor exceptions to this order.

III. Decomposition products, e.g., erythrite or cobalt bloom, annabergite and asbolite.

II. Rich silver ores and calcite.

1. Smaltite, niccolite and dolomite or pink spar.

After the minerals of group I. were deposited the veins were subjected to a slight movement. In the cracks thus formed the minerals of group II. were deposited. A few veins that escaped the disturbance do not contain silver in economic quantity.

This order of deposition appears to be the same as that of the minerals in the Annaberg deposits of Germany and in those of Joachimsthal, Austria. At Annaberg the uranium ore or pitchblende is said to have been deposited earlier than the rich silver ores and later than the cobalt-nickel minerals, while barite, fluorite and quartz were deposited prior to the latter. At Annaberg there are thus considered to have been broadly five periods of deposition, while at Cobalt there have been but three, minerals representing the first and third periods being absent.

# MINING AND THE CANADIAN NORTHERN RAILWAY

(Continued from July 1st issue.)

**Marble Quarries at Bronson, Ontario.**

The Ontario Marble Quarries, Limited, is quarrying marble at Bronson, on the Central Ontario Railway, two miles south of Bancroft, in the County of Hastings.

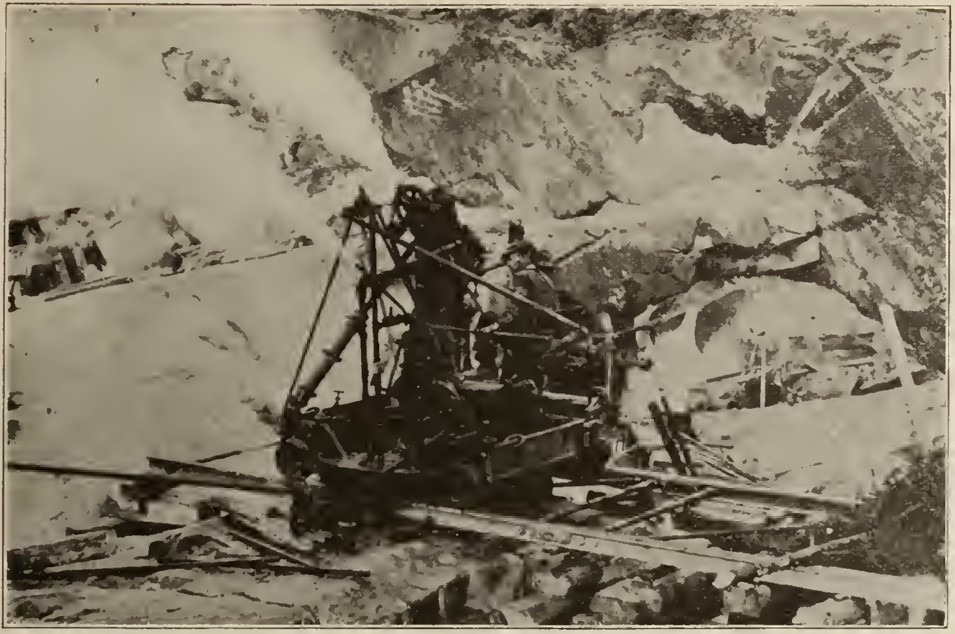
These quarries are producing material which in colour beauty and variety of marking, and size of slabs, compare favourably with any other marble on the market. Among the buildings in which it has been used for interior decoration, are the New Standard Bank Building, King street west, Toronto; the C.P.R. building in Montreal, and buildings in Winnipeg and Vancouver. Their plant is about one-half mile above the station at Bronson. A siding is being built into quarry No. 3, close to the railway, and it will be extended to the plant and connect the three quarries, the farthest of which is about one-half mile from the railway.

**No. 1 quarry**, on lots 28-29, 10th concession, Dungannon, has an excavation about 100 ft. long, 60 ft. wide and 25 ft. deep. The rock is cut in blocks by a channeling machine, which is driven by steam. The blocks vary in size, but they average 6 x 5 x 5 feet, and weigh about 20 tons. The blocks are picked up by a 20-ton derrick placed on a small tram car and taken direct to the mill, run under the saw, and cut into slabs without being removed from the car.

The colour of the marble in this quarry varies. Much of it is a variegated green and white, some of it is white with green veining. East of No. 1 quarry, a little work has been done to show up a fine face of green marble of very beautiful colour and fine grain, which will prove most valuable for interior work.

Dr. W. A. Parks, in his report on Building and Ornamental Stones of Canada, says of the marble at No. 1 Quarry:—

"The general strike of the belt is N. 70 deg., in which direction the continuity of the deposit has been proved by test pits for at least 1,000 feet. The width is stated by Mr. Morrison to be 1,000 feet, but owing to the overburden, it is not easily ascertained.



Cutting marble at quarry near Bronson, Ont. Marble Quarries, Ltd.

"Different types of marble are arranged in bands parallel to the strike. From the north to the south the following varieties are recognized:—

(1) A laminated green variety.

(2) A green variety with broad bands and clouds of white and pink.

(3) A light green marble with bands of white.

(4) A light cream ground with green bands and cloudings.

(5) A pink ground with green, blue and white foliated bands.

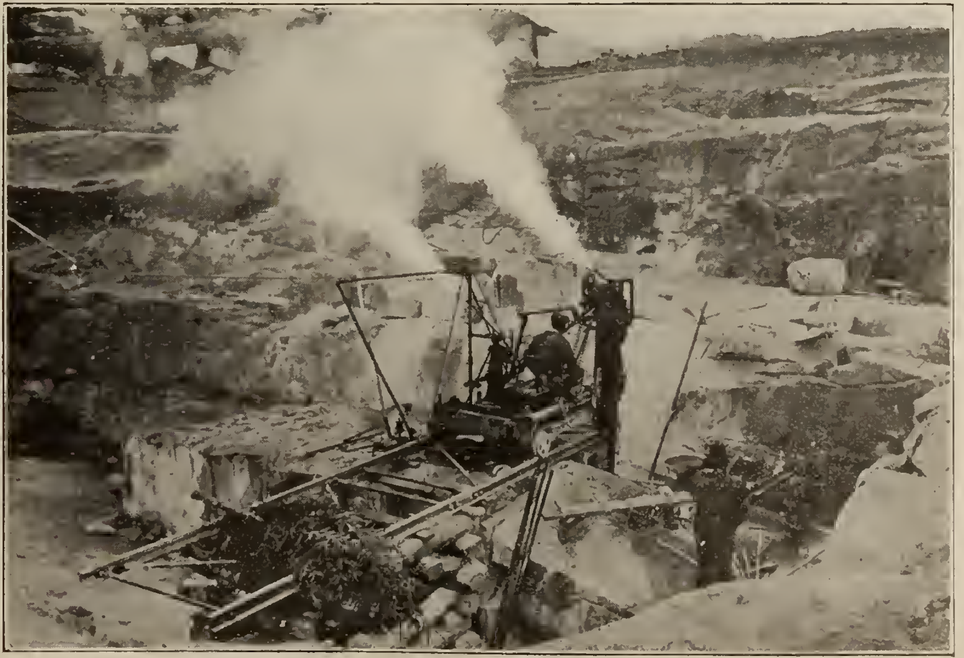
(6) A blue variety with very fine white veins.

"The deposit, as exposed on the hills near the mill, is remarkably free from surface cracking and weathering, which argues well for the durability of the stone. The surface alteration is so insignificant that large blocks with the adhering earth, go directly to the mill and result in an entirely satisfactory product.

"Clean vertical joints striking S 20 deg. E. cut the deposit at an average distance apart of 20 feet. There is very little minor jointing. Blocks 25 feet square could be obtained and several 4 x 5 x 10 have already been quarried. Horizontal partings (floors) occur at intervals of 10 or 12 feet."

**No. 2 quarry** on lot 41 West Hastings Road, is about a quarter of a mile west of No. 1. The marble of this quarry is found in a variety of colours, pink, white with a greenish cast, mottled and brecciated, and very dark green. Some shows a blending of mauve and grey, and some a mixture of red and black.

Dr. W. A. Parks says of the rock on lots 41 and 42, Hastings Road:—



Channeler in operation near Bronson, Ont. Marble Quarries, Ltd.

"The most beautiful and delicate marbles of this property, are exposed along the brow of a considerable hill running north and south towards the eastern border of the lots. The upper 50 feet of the bluff consists of the marbles about to be described, but whether these extend to greater depths or whether they overlie the Rose fantasia, I am unable at the present time to say.

"The general strike of these deposits is 5 deg. S. of E. and the dip 80 deg. to the north. Beginning at the south, the first belt is about 100 feet wide and consists of a beautiful fine grained semi-translucent base with brown and green bands and contorted stripes.

"Towards the north this band is less prominently marked and presents the same base with much fainter cloudings. Then follows a narrow dyke of basic eruptive, north of which the Rose fantasia rises to a higher level and is succeeded by 150 feet of beautiful brecciated varieties.

"This brecciated zone is followed by about 200 feet of a fine grained, delicate pink variety with black bands and clouds.

"A brown veined partly brecciated variety follows.

"The continuity of the exposure is interrupted at this point for a considerable distance, but another opening 750 feet from the southern limit shows a large body of a brown and red veined variety."

**No. 3 quarry** is close to the railway. Here is found a very large deposit of white marble which will have a great commercial value. There are two deposits of this white marble, one 70 feet and the other about 100 feet wide. They are both about 700 feet long, according to the development work done upon them now. None of this has been marketed yet, and will not be until the railway spur has been completed, when the blocks already taken out will be shipped direct to Toronto to be finished.

**Blocks of marble at Ontario Marble Quarries, near Bronson, Ont.**

**The plant** consists of a 90 H.P. boiler, one engine and four gang saws, each of these saws contains about 40 to 45 blades. The blades can be placed to saw any thickness, but the average is about one inch. The cutting is done by feeding sand and water to the saw. When the sawing is finished, it leaves a smooth, soft surface. The marble in this form is shipped to Toronto, where it is polished and cut to size, according to the requirements of the trade. These quarries at present employ about 50 men. Mr. T. Morrison, one of the owners, acts as the manager.

# THE WITWATERS RAND GOLD INDUSTRY IN 1912*

By W. L. Honnold.

In the light of the data now available for the past year it is clear that, taken as a whole, the mines of the Rand have made noticeable advancement. This is true in respect of both operation and intrinsic soundness, as well as of the financial position generally.

A total of 25,486,361 tons were milled by an average of about sixty producing companies, as against 23,888,258 tons during the previous year. The yield in gold amounted to $181,080,211, equivalent to $7.06 per ton, which was $0.26 per ton better than the yield for 1911. The gold won was therefore 10.8 per cent. greater, although the scale of operations increased by only 6.7 per cent. Explanation lies partly in the fact that for the year before the unit recovery was abnormally reduced because several companies mined an unnecessary proportion of unpayable ore. Compari-

*The Michigan College of Mines Alumnus, July, 1913.

son is further complicated by the fact that in both years several companies, for good reasons, worked somewhat above the grade called for by their ore reserves.

The average working cost advanced from $4.38 to $4.54. This apparent advance should not be taken too literally, since, to some extent, it arises out of the fact that the figure for 1911 was unduly low because of the mistaken policy of mining unpayable ore referred to in the preceding paragraph. On the other hand there were certain factors which undoubtedly affected costs unfavourably. Chief amongst these may be mentioned the continued tendency to higher cost of native recruiting and wages, a tendency fortunately now checked by the formation of the Native Labour Corporation, which will deal with the matter co-operatively and correct in some measure the past disadvantages of competition. Costs were also adversely influenced by the greater inefficiency of white labour, the incidence of the eight hour law, increasingly exacting Government regulations, and the expenditure called for in consequence of legislation for the compensation of miners suffering from phthisis. The latter charge is in the way of being largely eliminated by concerted maintenance of a moist atmosphere throughout the mines by liberal spraying. In considering working costs it has also to be borne in mind that in 1912, as in the preceding year, there was a disposition in many instances to charge directly to working accounts extraordinary items which, if money could have been raised as freely in the past, would have been dealt with as capital expenditure.

Working profits totalled $61,742,322, as compared with $55,595,243 for 1911, a gain of slightly over 11 per cent. The per-ton figures for the two years were $2.44 and $2.33 respectively.

In the matter of dividends the showing is outwardly not so satisfactory. There was an increase of $924,851 in the aggregate distribution, making the total for the year $38,731,080, but the per-ton declarations averaged only $1.52 as against $1.58 for the previous year. The explanation lies chiefly in that the money markets were unfavourable to the provision of additional working capital. As in the year before, large amounts had to be appropriated to cover extraordinary expenditures, in connection with additions and alterations, both underground and at the surface, which have had to be undertaken at this stage, more particularly in connection with the recently merged properties. Under more propitious monetary circumstances these appropriations would have been charged to capital account. This point will perhaps be clearer if the following per-ton figures are considered:

1910—Working profit, $2.56; distributed, $1.97; undistributed $.59.

1911—Working profit, $2.33; distributed, $1.58; undistributed, $0.75.

1912—Working profit, $2.44; distributed. $1.52; undistributed. $0.92.

The tendency shown by this comparison would be cause for uneasiness were it not that the special improvements to which it is due are either completed or nearing completion. It has, however, to be borne in mind that, arising out of the hopeful feeling which prevailed in 1910, certain mines over-reached themselves and made a better showing than their intrinsic position warrants. Figures for that year consequently cannot be taken as an absolute basis of comparison, although in the aggregate they were not far out and may be again realized. One is forced to the conclusion, therefore, that the relatively poor showing of the last two years in the matter of dividends is not due to intrinsic deterioration but to an enforced change in financial policy, temporarily inconvenient, no doubt, but in the long run of advantage to shareholders.

Whether and to what extent it may be possible and advisable to bring about a closer relationship between working profit and dividend than that shown above, is a question open to difference of opinion, but not so simple as has been suggested. If we take working cost as covering all head office, maintenance and operating expenses, including the development called for by the equipment provided, then the remaining supercharges against working profit fall chiefly under the headings Interest and Redemption of Loans, Profits Tax, and Capital Expenditure. It would, of course, be possible to add to the published monthly and quarterly costs a fixed charge per ton under each of these three headings, or any others that might be called for. These fixed charges would be based on experience and probability and would be fairly reliable as to loans and profits tax, although in the latter case, owing to its determination being a matter of complex calculation by Government officials at the close of the year, only an approximate figure could be used.

The matter of capital expenditure, however, would present far more difficulty. As commonly interpreted it embraces all the various and varying items of extraordinary expenditure called for in order to conform to engineering progress, meet the demands of expansion, and deal with both incidental and accidental exigencies of major importance, items, obviously that cannot be charged directly to working costs without perversion of the comparative value of the latter and the consequent confusion of the shareholders. It is not surprising that directors and engineers hesitate to forecast expenditure under so problematical a heading. If a true approximation were attempted, those responsible would probably find themselves either trammelled by underestimates or criticized for misleading overestimates. In practice, the latter chance would probably be taken as the lesser of two evils and generous provision would be taken against contingencies, a course hardly favourable to economy.

It may be urged that any resulting surplus could be carried forward or credited to general revenue and expenditure. But this is equivalent to abandonment of the advantage aimed at; for the surplus might equal the margin of uncertainty under the present policy.

Even if it were possible to forcast the expenditure with approximate accuracy, and this forecast were embodied in the monthly and quarterly reports, the showing would still be open to misconstruction owing to uncertainty as to the financial policy that might be called for at the close of the year, more particularly as to the matter of balance forward. Furthermore, the financial policy of a company is open to modification in accordance with market conditions, or other circumstances, and there are a number of companies which at a favourable moment may, by new share issues or otherwise, materially alter their position and thus make available for distribution amounts that have now to be apportioned to capital expenditure. Enough has been said to show that the question is not so simple as has been implied by some critics. The prevailing custom admittedly results in interim reports which do not directly reflect the dividend position. Such perfection, however, is not aimed at—it might be realized by some of the companies some of the time, but not by all the companies all the time, a consideration of special bearing where uniformity is so important as on the Rand. All that is claimed for the monthly and quarterly reports as now published is that they provide confirmation or modification of certain comparative data, the dividend significance of which has been previously foreshadowed by precedent and prophecy with as much certainty as would probably result from a more ambitious attempt. Taken in this light, much can be said in their favour. It should, perhaps, be added that some critics have advocated going to the other extreme and publishing no interim reports whatever, their argument being that, apart from the fact that at best such publications may prove misleading in some degree, there is the practical consideration that they may lead to a somewhat costly struggle for regularity in matters essentially irregular.

With regard to the industry as a whole, it is doubtful if, taken from the standpoint of actual demonstration, it has ever shown greater soundness, i.e., a more satisfactory correlation between salient factors. The financial position of the companies generally is unusually strong. Plants are in good condition and have been enlarged whenever necessary to meet the demands of expansion. Necessary underground haulage ways and mechanical features have been provided to meet the requirements of increasing tonnage and greater tramming distance. Development is well in advance and there is apparently no material change in tenor. The native labour situation is probably more satisfactory than ever before and is in the way of further improvement, partly through the better organization recently effected, and partly through the wider use of machine drills. In the latter connection it is interesting to note that the number in use has increased by about 57 per cent. within the last two years, a total of 5,634 drills now being employed. Unfortunately, the white labour position is not so satisfactory, this country like most others having now to contend against both shortage and inefficiency. This difficulty will probably disappear when it is recognized, as it inevitably must be sooner or later, that the existing prejudice against the employment of natives of superior capacity on certain so-called skilled labour is unreasonable and inadvisable under the circumstances. The prospect in this connection, however, is too vague to be reckoned on at present. Generally speaking, the mines are neither unduly pressed as to tonnage and grade, nor over-strained as to dividends. In fact, there is a reserve of strength in the working position that promises to find expression in a materially improved showing for the current year.

# SILVER LEAD AND ZINC DEPOSITS OF SLOCAN, B.C.*

By O. E. Leroy.

Although the lead deposits in the vicinity of Ainsworth on Kootenay Lake were being worked in the later 80's, it was not until 1891 that the richer and more important ore deposits were staked inland from Kootenay Lake and further to the west. In the early years the transportation difficulties were great, so that it was not until 1895 that important shipments were made. The total production from 1895 to the end of 1911 in round numbers amounts to 795,000 tons of ore, containing 30,875,000 ounces of silver, 2,890 ounces of gold, 269,460,000 pounds of lead with a total value of nearly $29,000,000. The zinc returns from 1907 to 1911 are valued at nearly $1,000,000.

**General Geology.**—The deposits occur in the granitic works of the Nelson batholith, but particularly in the sedimentary rocks of the Slocan series (Carboniferous?). The granitic rocks range from true granite to quartz diorite. They are almost prevailingly of a light grey colour and the texture ranges from medium to coarse grain. Outside of the main area of the batholith the rocks appear in the sedimentaries as dikes, stocks and irregular masses.

The Slocan series consists of interbedded argillaceous quartzites and limestones, and slates or argillites which are more or less carbonaceous. They form an undoubtedly thick series, but the folding, faulting and lithological similarity prevent any section being made that would give even an approximation of the actual thickness. The series is extensively diked by quartz porphyry and lamprophyres which are older than the fissure system containing the ore bodies.

**Veins.**—The veins are nearly all of the fissure type and are much more numerous in the Slocan series. There they almost invariably cut across the strike of the formation, if they coincide in strike they cut across the dip and terminate usually by either turning suddenly and following a bedding plane or by feathering out in the broader bands of the softer slates. The veins vary in length from a few hundred feet to over 4,000 feet and in thickness from a few inches to over 50 feet. In exceptional cases the vein may attain a thickness of 150 feet.

The widest portions of the veins are generally filled with crushed and broken country rock with but relatively small amounts of the gangue minerals. In certain definite areas the fissures form a widely paralled system; the dips range from 40 to 80 degrees and as a rule are well over 50 degrees.

**Ore Shoots.**—The ore shoots are composite in character and consist of widely parallel bands, lenses and masses of galena and zinc blende alternating with siderite and to a less extent with quartz and calcite. As a rule the high grade ore favours the hanging wall side of the vein, though this is not invariably so. The shoots also favour the carbonaceous slates rather than the quartzites, porphyry stocks or dikes, but the reverse again holds in a few instances. Another favourable factor in the formation of shoots is the cross fissures which pass across the vein from either the foot or hanging wall side. These appear to have formed accessible channels for the metal bearing solutions. The shoots vary in length from 15 or 20 feet to 400 feet or over, and in width from a few inches to 40 feet.

The vertical component varies from 10 feet or so to 500 and 600 feet in the larger bodies. In many cases with, however, numerous exceptions, the shoot bears a relation to the topography of the country and pitches out of the hill. With depth the ore gets poorer and passes into slightly mineralized gangue and crushed rock.

**Mineral composition.**—The chief metallic minerals are galena and zinc blende. With freibergite as the important silver bearing ore, ruby and native silver and argentite are found in many of the deposits developed along fractures in the more massive ore.

*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.

Chalcopyrite and pyrite are almost invariably present, the former in small amount, the latter in increasing quantity as the lead content diminishes. The zone of weathering is very shallow, but originally contained carbonates of lead, zinc and copper and in one instance linarite, a sulphate of lead and copper.

The gangue is composed of siderite, calcite and quartz in varying proportions, the quartz content usually increasing with depth.

At present the metallic contents of the ores mined range from 7 per cent. of lead and 20 ounces of silver to the ton to one carrying from 50 to 75 per cent. of lead and from 80 to 175 ounces of silver to the ton. In some mines there is a little gold which ranges in value from $1.00 to $7.00 to the ton.

**Origin.**—No definite law holds with regard to the order of the formation of the several minerals. In many instances, however, siderite was formed first, followed by zinc blende which replaced a portion of the siderite. Galena succeeded the blende, and freibergite followed, filling in fractures in the galena and to a certain extent in the blende.

The ore appears in great part to be primary and to have been introduced by ascending solutions which deposited their mineral content in the wider portions of the veins at favourable horizons, where the action was aided by decrease of pressure, lower temperature and by the reducing action of the carbon in the crushed rock which forms an important percentage of the vein filling.

The ore was probably derived from some horizon of the granitic rocks of the batholith which underlies the whole area and is perhaps closely connected with the basic lamprophyric dikes. In several instances it was noted that veins followed the same fissures as the dikes, in which cases the ore lay on and along the dike.

Many of the ore shoots so far stoped have been comparatively shallow, but more recent development work has shown ore at greater depths, in one case 1,270 feet (387 m.) below the outcrop. The development of the last two years has encouraged the belief that the ore shoots are not merely surface deposits, but that they will be found to have a much greater vertical range than was formerly believed.

# THE KOOTENAY ZINC PROBLEM

On August 21st at Nelson, B. C., Hon. Louis Coderre, Secretary of State and Minister of Mines of Canada, met a number of members of the Nelson Board of Trade and local mining men, to discuss the zinc problem. The following account of the meeting, published in the Nelson Daily News, contains statements made by several of those present:—

After listening to the statements by members of the Board of Trade and mining men of the district, in which the necessity for the continuation by the Dominion Government of experiments in the treatment of complex zinc ores and for the appointment of a royal commission to make a thorough investigation into the requirements of the mining industry was urged, Hon. Louis Coderre, Secretary of State and Minister of Mines, yesterday morning announced that he had just despatched to Dr. Eugene Haanel, Director of the Federal Department of Mines, instructions to authorize E. Didolph, who is now in Nelson, to proceed at once with the work at the zinc plant in Fairview. Expenses of the work will be covered, he explained, by $30,000, which remains of the grant of $50,000 originally made for the purpose of experiments in methods of treating zinc ores. He inspected the plant yesterday morning.

Evidently deeply interested in the proposal that the Government should name a royal commission on mining, in order that it might be placed in possession of complete information regarding the industry, Mr. Coderre said that he really believed something could be done on that line and promised that he would place the matter before the cabinet next month, and would endeavour to bring about action which would be satisfactory.

Himself bringing up the question of the desire for the creation of a separate portfolio of mines in order that the industry might have the benefit of the complete attention of a minister, Mr. Coderre promised to lay the wishes of the board and the mining men before Premier Borden and the other members of the Cabinet.

**Mr. Coderre Shows Keen Interest in Subject.**—Throughout the speeches of the Board of Trade members and the minimn men the ministers displayed the deepest interest, asking frequent questions in order to clear up points about which he was in doubt.

When he heard that he was expected to visit the West with the members of the International Geological Congress, he had felt pleased because he had realized that the trip would give him an opportunity to see those interested in mining, hear what they had to say, and gain a thorough understanding of the requirements of the industry through personal contact, said Mr. Coderre, in making his reply. Having accepted the portfolio of Minister of Mines, he was most anxious to understand the industry's needs, and learn of the remedies which might be brought to bear.

Speaking of R. F. Green, M.P., the Minister said that he would meet him in Victoria, as the member for Kootenay had taken a great interest in the various mining questions last session. Many times Mr. Green was in the speaker's office pressing on his attention the needs of the industry.

In conclusion, after thanking the Nelson board and the mining men for the entertainment given in Nelson to himself and the geologists, Mr. Coderre said that he believed that the proposed commission could collect all the facts necessary for the Government to make a decision regarding aid to the lead mining industry, the question of zinc ore treatment and other matters of importance.

**Kootenay-Boundary Output Large.**—In introducing the speaker to Mr. Coderre, W. F. Roberts, President of the Board of Trade, recalled that the Nelson board had been instrumental in bringing to the attention of the Government many matters of importance to the mining industry. In 1912, the mineral output of Kootenay and Boundary was about $20,000,000, which was approximately two-thirds of the output of British Columbia, which was one-sixteenth of the total production of Canada. While gold, silver and coal took a prominent place in the total output of Kootenay and Boundary, this district was especially interested in lead and zinc mining, as it produced about 90 per cent. of the total lead output of the Dominion, and practically all the zinc. He concluded by expressing the thanks in which other speakers joined, to the minister and the Government for the extension of the lead bounty and the work at the zinc smelter, and referred to the need for a royal commission to secure evidence as to the best means of placing the lead and zinc mining industries on a stable basis.

**Mr. F. A. Starkey.**—Mining was possibly the most important industry in Kootenay to-day, declared Fred A. Starkey, President of the Associated Boards of Trade of Eastern British Columbia, who related the history of the lead bounty and stated that it had done a great deal of good. The position as to the zinc industry, was that the ore could not be treated in this country and had to be shipped, if sufficiently high grade to stand freight and smelting expense, to the United States. He remarked that he considered it wrong in principle for such a condition of affairs to exist on the ground that an American industry was being built up out of a Canadian natural resource. The suggested royal commission could go into the whole question of assistance to the lead industry, whether by bounty or by duty or by other means, he said.

Speaking of the experiments in the reduction of complex zinc ores, Mr. Starkey suggested that, even if the work did not result in entire success, such results as were attained should be given over to anyone who would build a plant with the idea of improving it. Such a plant should, he suggested, be financially aided by the Government. There were tremendous quantities of zinc ore in the mountains of this district and all that was required was a method of treating it, he said.

**Aids All Other Industries.**—Asking the minister to use his influence toward the appointment of the royal commission, Mr. Starkey declared that the prosperity of the mining industry meant the prosperity of every other industry in the surrounding district.

Speaking of the ore testing laboratory at Ottawa, which has been recently established, Mr. Starkey suggested that it would prove of still greater advantage to prospectors and small mine owners if samples of ore of from 25 to 50 pounds could be sent, instead of from 200 to 500 pounds, as provided under the regulations of the Department. Such a comparatively large amount of ore cost a considerable sum in freight charges, he explained.

**Mr. S. S. Fowler.**—S. S. Fowler remarked that while Mr. Coderre was the fourth Minister of Mines in the present Government, he was the first who had paid a visit to Kootenay in that capacity. The visit of the minister was appreciated very much, said Mr. Fowler, as personal contact was essential to the proper understanding of the conditions and the requirements of the industry. Standing second to agriculture in value of total output in the Dominion, the mining industry should be encouraged and fostered in every possible way.

While British Columbia's total mineral output bore an important ratio to the total production of the Dominion, and while practically all the lead and zinc of Canada was produced within a comparatively few miles from where the minister was sitting, this district was the farthest from the point of production of the things which the industry consumed and the farthest from the point of consumption of its product than any other mining district in Canada, he declared, the industry here having an additional handicap in the high cost of labour and materials, the latter resulting from the distance which goods had to be transported. Another handicap, which applied to the lead mining industry, was that there were no official quotations of the metal in Canada, and the lower London prices consequently had to be accepted.

What the lead and zinc mining industry most needed in order to encourage the investment of capital here. was permanency of conditions as far as it was possible to obtain them. To illustrate his point, Mr. Fowler quoted the lead bounty, which assures the producer £18 per ton, even when the market price is below that figure. The bounty is paid whenever the price falls below £18 and until it drops to £14, thus enabling the mine owner to figure with reasonable certainty upon his returns, explained Mr. Fowler.

**Bounty Keeps Bluebell Busy.**—Were it not for the lead bounty the Bluebell Mine, of which he is manager, and which employs about 100 men, would not now be in operation, he declared. There were, he continued, several of the largest producers of lead which could not exist without the bounty.

Referring to zinc and to the enormous loss suffered by zinc mine owners through the lack of a method of treatment, Mr. Fowler estimated that in the mines of the country there was probably 50 per cent. more zinc than lead, which meant that every pound of lead was accompanied by one and one-half pounds of zinc, which was now being thrown away. If this wasted zinc could be treated, it would, at present prices, return more to the mine owner than the lead.

After congratulating the Government upon what he described as the practical manner in which it was proceeding in its efforts to solve the zinc problem. Mr. Fowler remarked that all these matters could be brought before a royal commission, if such were appointed.

**Should Look to Future.**—While the lead bounty during the years that it had been in operation, had been of very considerable benefit, and the mine owners were grateful to the Government for the extension granted at the last session, the mining industry was one which was not developed in a day, and it was necessary that steps should be taken toward providing for the assistance of the industry in future years, said Ernest Levy, manager of the Van Roi Mine at Silverton, and the Le Roi No. 2 at Rossland, who, in making a plea for the appointment of a commission, emphasized the fact that such a body could gather the information upon which the Government could act when the necessity would arise in about four years, when the lead bounty extension expires.

As a mining district, Kootenay and Boundary, already of considerable importance, would be of very much greater importance, declared Mr. Levy, who said that he regarded the lead bounty more as a temporary expediment than as a permanent form of aid to the industry. What form the aid to be granted should take would be a matter to be decided by the Government on the recommendations of the proposed commission, which could also go into the zinc question, the speaker agreeing with Mr. Fowler that the latter was of as much, if not of greater moment than the lead question.

**Charges Eat Up Zinc Values.**—To illustrate the difficulty of mining zinc at a profit, Mr. Levy stated that on a ton of ore or concentrates which assayed 45 per cent. zinc, the freight and duty when sent to an American smelter, was equivalent to the value of a ton of such ore at a price of $5 per 100 pounds, St. Louis. Therefore, it was only when such a zinc ore contained silver that it could be shipped out at a profit, the zinc values being eaten up by the charges. If the ore could be treated in Canada, much of freight and all duty would be saved. Reports of the progress made on the zine experiments by the Government would be valuable to mine owners, he suggested.

Speaking of the process for the treatment of refractory zinc ores invented by A. Gordon French, J. O. Patenaude declared that he was able to announce that the Consolidated Mining & Smelting Company would next month be producing zinc by this method on a fairly large scale at its plant at Trail. In Nelson Mr. French had experimented with the process until he had it nearly perfect, so that it would save all but 2 per cent. of the zinc in a complex ore, together with a larger percentage of silver and lead than was secured by ordinary smelting methods, he said. In addition, Mr. French's method saved manganese, which was worth about $75 per ton, said Mr. Patenaude. Pure zinc could be produced by the French method for half a cent per pound, he continued.

Questioned regarding the statement made by Mr. Patenaude, R. H. Stewart, general manager of the Consolidated Mining & Smelting Company, stated that the company had not any such announcement to make.

A vote of thanks to the minister for attending the meeting was passed on a motion by Ald. James Johnstone, seconded by W. G. Foster.

Those present were: W. F. Roberts, Fred A. Starkey, J. O. Patenaude, J. E. Annable, Hugh W. Robertson, E. Didolph, W. G. Foster, T. A. Robley, S. S. Fowler, Ernest Levy, A. B. Netherby, L. K. Larson, J. H. D. Benson, W. J. Meagher, Ald. James Johnstone, W. F. Cochrane, E. K. Beeston, Edward Peters, A. T. Eyton, R. Smillie, W. H. Jones and Harry Amas.

# MICHIGAN COPPER MINE MANAGERS STATE TERMS ON WHICH THEY WILL RE-EMPLOY MEN

The following is the text of the statement made by the mine managers of the copper country to Governor Ferris, through Judge Murphy:

"At the recent meeting with you of the mine managers of Houghton and Keweenaw counties, the operations of whose mines is affected by the existing 'strike' conditions, you submitted to us the following question:

" 'Eliminating any recognition now or hereafter of the Western Federation of Miners, what terms and conditions of labour will you authorize me, as the representative of the governor, to present to anyone interested, as the basis for the re-employment of your men?'

"You are authorized as representative of the governor to state that the men will be re-employed on the same terms and conditions of labour as existed at the several properties prior to the inception of the strike. That in such re-employment the fact that a former employee has been a member of, or otherwise affiliated with the Western Federation of Miners, will not of itself be considered as a bar to his re-entering our employ. But we reserve the right to use our individual discretion as to the re-employment of any who may be known to have engaged in acts of agitation, lawlessness, violence or intimidation, or inciting thereto, after such employment and the cessation of strike conditions. Any alleged grievances, affecting the entire body of the employees at any mining property, or affecting individuals, brought to the attention of anyone of us through his own employees, will be given full consideration, with the desire as in the past, of each of us severally, to correct any wrongs that we may find to exist, either in individual instances or in general conditions.

"The foregoing answer to your question is the basis for the re-employment of our men. The great differences in working conditions existing at the various mines have made it impossible to formulate a statement of the terms and conditions of labour which could be made uniformly applicable to the several mines with justice to their respective employees or with fairness to the several mining companies. But you are further authorized, assuming such re-employment ensues, to state with respect to matters mentioned by you at our conference.

"As to wages, let us say that the adoption of a uniform minimum wage is impracticable owing to the great differences in conditions at the several properties. But to you, as the representative of the governor, we will, when the work is resumed, and for a reasonable period thereafter, submit our payrolls and all material data, and if, after being informed as to attendant conditions and circumstances, you find any iniquities in specific individual instances, they will be remedied in accordance with your recommendations. If, taking into full consideration the living and working conditions, the advantages and privileges furnished to or for the employees, the costs of mining and production and all material circumstances, you find at any of our mines that the general rates of wages as to any class or all classes of employees are inadequate, unfair or inequitable, we will severally give full and fair consideration to your recommendations in that regard.

"As to the working hours we have each had for some time under consideration a change in this respect with the intention, if and so far as found practicable, to bring about as near an approach as conditions may warrant to an eight-hour day for our underground employees, a portion of whom have heretofore been in close approximation to that condition. The present situation does not alter our intentions. Any change of this character involves to a great extent a reorganization of the operations, and for that reason must be a gradual one. The time within which it can be brought about cannot now be stated. We can now state only the fact that it has been and is under favourable consideration.

"As to the one-man drill, we can only state that with respect to this, as to all our operations, our efforts, in advance of all other considerations, are exerted toward securing the safety of our employees. The conditions of competition, the low-grade of our rock as compared with other districts, the increasing expense with debts and other conditions have made the use of the one-man drill imperative for the continuation of operations.

"The request for nonemployment of boys under 18 is clearly a matter for the legislature. The foregoing involves as a condition the early cessation of strike conditions, the elimination of any recognition now or hereafter of the Western Federation of Miners and the withdrawal from that organization of those of its members who may be re-employed. This is not imposed to a condition of an arbitrary nature, nor is it stated through illwill, but must be recognized that in view of the nature of the teachings and utterances of such leaders in their addresses to their members and to the public with respect to ourselves, our officials, our employees and our companies, there cannot be a restoration of harmony, good feeling and mutual respect between employers and employees, between bosses and men, or among the men themselves in any other way. To act otherwise on our part, to fail to bring about such restoration, most essential to the welfare of our men and of the community and the state, would be to invite an early renewal of strife.

"James MacNaughton, general manager of the Calumet and Hecla Mining Company, Ahmeek Mining Company, Allouez Mining Company, North Kearsarge mine, South Kearsarge mine, Tamarack Mining Company, Osceola Consolidated Mining Company, Laurium Mining Company, LaSalle Copper Company, Isle Royale Copper Company, Superior Copper Company, St. Louis Copper Company and Centennial Copper Mining Company.

"F. W. Denton, general manager of the Baltic Mining Company, Champion Copper Company and Trimountain Mining Company.

"Charles L. Lawton, general manager Quincy Mining Company.

"Theodore Dengler, agent of the Wolverine Copper Mining Company and Mohawk Mining Company.

"R. M. Edwards, president and general manager of the Franklin Mining Company, Indiana Mining Company, North Lake Mining Company, Algomah Mining Company, and general manager of South Lake Mining Company.

"J. L. Harris, general manager of the Hancock Consolidated Mining Company.

"R. R. Seeber, superintendent of the Winona Mining Company and Houghton Copper Company."

# OPPORTUNITIES IN MINING*

By James G. Ross.

The development of the mineral resources of Canada has been so rapid that mining is now the second greatest industry of the country. The value of the products of the mine is surpassed only by that of the farm. Only a very small proportion of the vast extent of the Dominion, much of which is favourable to the occurrence of mineral, has been prospected. The construction of railroads through regions hitherto difficult of access is opening up districts whose development gives promise of disclosing valuable deposits of mineral.

Of the vast number of men who took to the trail in the early Cobalt days many have become seasoned prospectors trained by hard experience. From these men, acquainted with the northern country, one expects news of new strikes. As districts become more readily accessible they have more time for actual rock knocking in the season and their chances of locating a vein are increased.

The knowledge gained in the north is being used to advantage in every new rush. Promiscuous claim staking is done only in time of excitement in order to hold ground for time to look it over. In cruising a new territory the prospector bides his time, but he finds a showing that holds promise of being worth developing. Many a prospector from experience gained in the newer camps recalls rocks or formations seen in former wanderings and takes the back trail to prospect the Maritime Provinces, Old Ontario, the Rainy River Country, or even British Columbia.

The good work done by the various Geological Surveys in mapping the country is of immense value in showing rock formations and routes. It would be even more valuable were the reports to state a little more definitely the parts of each district mapped most likely to repay careful prospecting.

The individual prospector has not yet been replaced by parties sent out by companies, as too much time is used in transporting supplies to keep a large party. The small syndicate formed to finance the prospector in opening up his property stands to make a good profit, as the market for promising claims partly developed is increasing. Organizations which in a systematic manner examine, buy and operate new properties, have grown out of successful ventures in the more recent camps. These afford to the prospector a ready market and to the small syndicate an opportunity of turning over partly developed claims.

Even in mining regions once thought to have been carefully prospected and in districts fairly well settled discoveries are being made. Tungsten is being shipped from a part of Nova Scotia formerly the scene of gold mining activity. China clay is being mined within 100 miles of Montreal in a country farmed for many years. Oil shale areas are being tested in the neighbourhood of the Alberta Mine, N.B., from which no shipments have been made in a decade.

There are many new districts of promise for the prospector and in which opportunities amy yet come for profits such as the deposits of Sudbury and Cobalt have given.

The coal and gypsum deposits of the Maritime Provinces are rather beyond the scope of the prospector, but afford a field for syndicates and mining companies to open up those areas as still unworked which are favorably situated. The old gold fields of Nova Scotia, probably still contain deposits, which, if properly worked, would yield satisfactory returns.

Iron and manganese deposits in New Brunswick may still be found, and if in suitable locations will receive the attention of capitalists. Molybdenite, tungsten and even tin are reported in Northern New Brunswick. The Transcontinental Railway opens a district from the St. Lawrence River to Moncton, part of which have heretofore been difficult of access.

In Quebec the iron sands of the Lower St. Lawrence are being investigated by the Department of Mines and may yet be the scene of large industrial development.

The Asbestos industry seems to be emerging from its dark days and a new deposit in this area would not be difficult to dispose of. Renewed interest in the copper district of the Eastern Townships is being shown, with the erection of a custom smelter many of the deposits worked in the 60's would be again reopened and a search for new ones actively pursued.

From the extensive country north of the St. Lawrence to Hudson Strait about all that has come out so far are stories of gold samples in the hands of Indians. The Transcontinental Railway and the North Railway will enable many an adventurous party to work contiguous territory more thoroughly now that the larger part of their time will not be required in transporting supplies.

The Hurricanaw, Bell River, Kewagami and Keenewesik countries have furnished alluring samples of gold

*From Journal of Commerce, Aug. 30, 1913.

and molybdenite and are favourably mentioned by the Geological Survey men.

Although trips have been made to Ungava for many years and during the last two years large parties have visited the country and long traverses made but little detailed prospecting has been done. What is required to investigate that territory is a well organized party, adequately financed, led by trained explorers, and composed of men prepared to remain several seasons on the ground to carry out a programme which has been definitely planned after a season's reconaissance.

In Eastern Ontario iron, gold, mica, graphite, galena, feldspar, talc and zinc are all being profitably mined and thorough prospecting in a district readily accessible should reveal more paying deposits.

In Northern Ontario railway construction discovered two unique camps, Sudbury and Cobalt. In the vast area between the Quebec and Manitoba boundaries and northward to the Bay, including the new district of Patricia is a promising field with room for many such areas as Cobalt and Porcupine. The Transcontinental, Canadian Northern and Algoma Central railways now enable much of this country to be easily reached. Though canoe routes through this country have been used by the Hudson's Bay Company ever since its formation, there are still unexplored areas within a few miles of the rivers.

In Northern Manitoba the railways to the Bay are opening a district in which the area of rock exposure predominates and, with supplies in easy reach, the prospector should soon be in here.

In Northern Alberta attention is being directed to occurrences of coal, gas, oil and tar sands.

British Columbia will for long be the happy hunting ground for the prospector. The unknown coal areas of the Crow's Nest Pass, Brazeau, Peace River, and other districts are continually being increased by the work of the indefatigable prospector and men of the Geological Survey.

For the last eight years the country adjacent to the Grand Trunk Pacific Railway from the foothills to the coast has been the scene of many promising finds by prospectors working the country ahead of the construction gangs to be ready to ship when the rails reached them. Many claims have been staked for coal, copper and silver-lead. As progress is slow with pack trains much of the time has been spent in packing in supplies at high rates. With the completion of the railway the prospectors will be able to go farther back to districts yet untouched.

There still remains a great part of British Columbia and the Yukon Territory, the only parts which have been prospected being the routes traversed in Cariboo days, and those only for placer gold. The Sushanna Placer deposits on the White Horse, Yukon, is the latest discovery reported.

As minerals afford so large a proportion of the country's wealth the prospector is worthy of every encouragement, both by the Government and by the railways, a goodly proportion of whose freight is furnished by the mine. The Northern Pacific Railway recognizes this fact to the extent of granting free transportation to the prospector and his outfit in their mountain division. The T. & N. O., Canadian Northern and Algoma Central railways employ their own mining engineers, while the C. P. R. has done much to bring mining to its present high state of production in British Columbia.

The mining industry is well worthy of the serious attention of investors. All the good properties have not been discovered and worked out. The investor, however, should examine a mineral proposition as carefully as any other and insist on capable men having charge of the expenditure of his money and developments of his property.

It seems to be a peculiar feature of investing in mining companies that the ordinary investor makes no effort to secure reliable information on a company in which he contemplates investing. It is quite useless to reiterate the advice so often given that a mining proposition should be as carefully investigated as any other business venture. Not only the probability of the ore yielding a profit as shown by the report of a reliable and competent engineer but also all other conditions such as capitalization, and personnel of directors and management. By regarding a mine as a legitimate industry and not as an adjacent to the stock market the chance of a profitable investment are probably greater than in any other line of industry.

## GRANBY.

The Boston News Bureau says:

The smart advance in Granby Consolidated to 77¼, a rise of 26¼ points from the year's low point( it sold as low as 33 last year) reflects the expectation that within a very few months the company will be in position to show earnings at the rate of between $15 and $20 per share.

If present anticipations are realized, the company on January 1 should begin to produce from its new Hidden Creek property at the rate of 20,000,000 pounds per annum, thus practically doubling the mine's production. Against this new output the only capital charge is $1,500,000 6 per cent. convertible bonds, exchangeable into stock at par, $100. The balance of the sums necessary to make possible this big increase in production has come from earnings.

At the present time Granby has outstanding only 152,000 shares, and for the year ended June 30 showed profits of practically $8 per share, or $1,207,661. This was on a copper market which averaged the company not far from 16½ cents.

The new Hidden Creek mine on a 17-cent copper market, when given time to warm up to its best efficiency, should produce annual earnings of $1,500,000, or $10 per share.

It requires no stretch of the imagination therefore to figure prospective Granby earnings of $20 per share.

In the newly acquired property Granby has blocked out between 8,000,000 and 9,000,000 tons of ore, or sufficient to last between 10 and 15 years, with the smelter treating 2,000 tons per day.

Granby has "come back" in no uncertain fashion. To make good the sudden discovery of declining ore reserves at its Grand Forks (British Columbia) mine, it started at once to secure another mine ,and in acquiring the Hidden Creek it has secured a property far more valuable than the original property.

## LABOUR DISPUTES.

According to the record maintained by the Department of Labour industrial conditions showed an improvement in regard to labour disputes during July. There were 24 in existence, as compared with 27 during the previous month. A still greater improvement is seen when the comparison is made between the present month and the corresponding period of last year when there were 46 strikes and lockouts existing in the Dominion. During July, 1913, about 152 firms and 8,000 employees were involved in strikes and lockouts as compared with 450 firms and 11,957 employees affected by trade disputes during the previous month. There was a slight increase in the loss of time to employees, about 188,000 working days being lost, as compared with approximately 181,000 during June. It may be mentioned that during July, 1912, upwards of 270,000 working days were lost from this cause. Two disputes of importance occurred during July, while of those that were in existence previous to this month, the most important as affecting industrial conditions, were those of coal miners on Vancouver Island and sawmill hands at St. John, N.B. These two disputes, together, accounted for a loss of upwards of 130,000 working days.

# THE COAL DEPOSITS AT NANAIMO, VANCOUVER ISLAND, B.C.*

By Charles H. Clapp.

There are at present three productive coal seams in the Nanaimo district lying in the following succession from the bottom upwards: the Wellington, the Newcastle, sometimes called the lower Douglas; and the Douglas. The lowest seam, the Wellington, occurs about 700 feet above the base of the Nanaimo series, overlying 600 feet of marine sandy shale, the Haslam formation. The Newcastle and Douglas seams, are only from 25 to 100 feet apart, and overlie the Wellington seam by about 1,000 feet, separated from it chiefly by a thick bedded conglomerate, the Extension formation. A fourth and small seam, called the little Wellington, locally overlies the Wellington at a distance of 20 to 50 feet. It has been mined in a small way.

The coals of the various seams are as a whole much alike, and furnish a bituminous coal of fair grade. The amount of fixed carbon in the best quality ranges from 45 to 60 per cent., and the ash from 5 to 10 per cent.

The most striking feature of the seams is their great variability in thickness and quality. The thickness varies from nothing to over 30 feet, sometimes within a lateral distance of less than 100 feet. This variation is caused by irregularities in either the roof or floor, and occasionally in both. In quality the seams vary from where they are entirely composed of clean, bright coal ,with about 5 per cent. ash, to where they are entirely composed of a dirty slickensided coal, locally called "rash," with over 50 per cent. ash. The following is a proximate analysis of the rash from the Wellington seam.

**Proximate Analysis by Fast Coking.**

| | |
|---|---|
| Water | 1.59 |
| Vol. combust | 24.15 |
| Fixed carbon | 19.29 |
| Ash | 54.97 |
| Sulphur | undet. |
| | 100. |

**The Wellington Seam** rests on a firm sandstone floor, which is fairly regular although a few sharp rolls do occur in it. The roof, however, varies greatly in character from sandy shale to conglomerate, with many irregularities, especially in the sandy shale. The average thickness of the seam is from 4 to 7 feet, but it occasionally pinches to virtually nothing, and then suddenly thickens to 10 or 12 feet. The floor may be nearly smooth, but the roof in passing from the thin to the thick portion of the seam rolls upward sharply and often irregularly. Occasionally the roof is overturned forming in one instance an overlap in the seam of at least 25 feet. These sharp rolls are locally called "faults." Invariably at the thin places or "pinches" the coal is dirty and slickensided, while in the thick places or "swells" it is clean, black in colour with a sub-brilliant lustre, and broken only by a few irregular joints. Rash is usually found near the top and bottom of the swells and rarely in thin partings near the centre. Even in the swells some bone is present as small lenses seldom more than a quarter of an inch thick. In some instances the coal is clean and unfractured against the upturned roof, but more commonly it is somewhat slickensided and even contorted. The roof at the rolls is always contorted and slickensided.

The strike of the rolls corresponds with the strike of the measures, that is, northwest to west, and the pinches occur in the northeast and north side of the rolls with the corresponding swells on the opposite side. Where the seam is overlapped, the overlap is to the northeast or north.

It appears from the evidence given above as if the variation was due in large part to a folding which affected the coal seams when the clean coal was in a fairly plastic condition. This conclusion is especially well substantiated in another part of the Wellington seam, where it is composed of several sub-seams separated by dirty slickensided coal or rash. During the deposition of the seam, conditions in which fairly clean carbonaceous matter was deposited must have alternated with those during which the carbonaceous matter was deposited with a large amount of silt. When the seam was folded, the clean coal was apparently forced away from the tight bends, where the folding caused an increase in the vertical pressure, and left the seam at these places composed almost entirely of rash. The clean coal flowed to where there was a corresponding relief of vertical pressure forming a swell where the seam, except for the rash at the top and bottom, consists chiefly of clean bright coal.

Besides the barren places or wants due to folding subsequent to the deposition of the same, there are large wants due solely to silting, for in some instances the silting must have persisted throughout the period of coal formation. Also large and persistent partings of shale occur between the sub-seams.

**The Douglas Seam.**—Both types of variation occur in the Douglas seam. The seam varies from nothing to 30 feet in thickness, and averages about five feet, although over large areas the average thickness of the mineable coal is between three and four feet. The floor of the Douglas seam is usually a rather weak sandy shale, and the roof, although stronger, is very variable, ranging from a sandy shale to a fine grained conglomerate, the principal type being a shaly sandstone with sandstone layers and lenses of fine grained

*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.

conglomerate. Unlike the conditions in the Wellington seam the pinches and swells are caused chiefly by irregularities in the floor, the roof being fairly smooth. At the pinches the seam is composed almost entirely of rash, like that of the Wellington seam, although as a rule it is harder. The coal occurring in the swell has a compact texture, but rather dull lustre. It is irregularly broken into large blocks. Near the pinches some of the coal is slickensided and contorted, but where these features are shown the coal contains a higher percentage of ash. The coal seam is displaced also by small faults, although an actual break seldom occurs, the coal having been forced along the plane or zone of dislocation. Rarely the entire seam folds or wrinkles without any appreciable variation in thickness.

**The Newcastle seam** is more regular than the Wellington or Douglas seams, but is thinner, varying, as far as known, from 20 to 45 inches where mined, and contains more numerous and more regular partings. It is also less extensive in area than the other two seams.

**Production.**—The coal has been the source of a flourishing industry for over 50 years. The Wellington seam has been mined at Wellington, Northfield, East Wellington, Harewood Plains, and Extension, and is at present mined by the Vancouver-Nanaimo Coal Mining Company at East Wellington and by the Canadian Collieries (Dunsmuir) Company near Extension. The Newcastle and Douglas seams, which are usually worked together, have been mined extensively in the vicinity of Nanaimo. The mines here are operated by the Western Fuel Company. There has also been a large production from the Douglas seam south of Nanaimo, notably at Chase River, Southfield, and South Wellington. In these localities the Newcastle seam, although readily located, is of doubtful value. There is only one mine producing at present in this district, the South Wellington mine, operated by the Pacific Coast Coal Mines. Both the Western Fuel Company and the Pacific Coast Coal Mines are sinking new shafts along the lower part of the Nanaimo river to open up the Douglas seam in depth. The present coal production is over 1,000,000 tons per year, and the importance of the Nanaimo district in the coal industry may be more readily comprehended when it is realized that it produces over one third of the entire coal output of British Columbia.

## HEDLEY GOLD MINING CO.'S PRODUCTION.

The Hedley Gazette states that there seems to be a persistent misconception on the outside as to the output of the Nickel Plate mine, in Camp Hedley, Similkameen district, British Columbia. In particular it complains that the Daily News of Nelson, B.C., placed the value of the output to the end of 1911 at $2,500,000 to $2,700,000, as compared with figures given in some detail by the Gazette, which total, to 1911, inclusive, $3,810,910; further, that an official guide book compiled in Ottawa for the use of members of the International Geological Congress shows a value to the beginning of 1913 of $3,250,000, while the Gazette claims a total to that time of $4,599,625. Adding the value of the production for seven months, to August 1, 1913, an aggregate value of $5,104,373 to that date is claimed by the Gazette. Now, while the detailed figures printed by the Gazette are higher for each of three years—1910, 1911 and 1912—than those published by the Hedley Gold Mining Co. as the value of the precious metal recovered in those years (the company's figures for other years are not at the time of writing available to the present writer), there is no doubt that the Gazette has good grounds for its protest against the persistent publication of misinformation concerning the value of the output of the Nickel Plate group of gold mines. There is just a possibility that the Nelson newspaper mentioned will now admit its error, made in an account of the Hedley Gold Mining Company's property published in the Daily News of July 15, 1913, but it is probably too late for a change to be made in the official publication which the Gazette states was prepared for the International Geological Congress. No information is given as to who was responsible for the mistake to which the Gazette has taken exception, but since Mr. Chas. Camsell gave, in his Memoir on the Hedley Mining District, the recovered value of 153,000 tons mined and treated from 1904 to the end of 1908 as approximately $2,142,000, there surely should not have been any difficulty in ascertaining the value recovered during the four years, 1909-1912. It would appear that the official statement, if as quoted by the Gazette, was about $1,250,000, or more than 25 per cent. short of the amount actually produced. Such serious inacuracy in a supposedly reliable publication is much to be deplored.

The detailed statement printed on August 28 by the Hedley Gazette is as follows:

| | |
|---|---|
| Value of production to end of 1907....... | $1,617,229 49 |
| " for 1908, 44,068 tons at $13.35 per ton. | 588,507 80 |
| " for 1909, 31,100 tons at $11.58 per ton. | 360,138 00 |
| " for 1910, 44,828 tons at $12.31 per ton. | 551,832 68 |
| " for 1911, 57,815 tons at $11.99 per ton. | 693,201 85 |
| " for 1912, 70,455 tons as per statem't.. | 788,715 05 |
| " for seven months of 1913, to July 31.. | 504,748 00 |
| | $5,104,372 87 |

An excerpt from the Hedley Gazette's review of the Hedley Gold Mining Co.'s progress in the year 1912 may prove of interest at this time. In the course of its comments on the year's work the Gazette observed: "As might be expected from the fact that the dividends have been greater during the year last past than in any previous year, 1912 has been a year of breaking records and all former achievements have had to take second place. The quantity of ore mined and milled has been greater; the bullion produced has been greater; the mill has accomplished a higher duty per stamp; the extraction has been higher, and, more important than all of them, the development done during the year has shown up foot for foot a vastly greater amount of ore than ever before with the result that the ore reserves have reached a point which puts the whole enterprise on 'easy street' for years to come, so far as the necessity for looking for new ore bodies is concerned. No wonder the ore reserves have increased so enormously, when it is known that every bit of the development done in the Nickel Plate during the year has been all in ore."

In the published report for 1912 of the Hedley Gold Mining Co., the following statement is made by the general superintendent: "We have no hesitation in stating that the minimum quantity of reserve ore, as shown by development and diamond drill, in the Nickel Plate and Iron Duke claims, is 413,000 tons, and that this ore will average at least $11.35 a ton."

The president of the company reported: "We acquired, in 1912, the adjoining claims, known as the Windfall group, lying to the northwest of our property. Our exploration work demonstrated that the ores pass into this acquired territory, which promises well for a long life to our mines.

# SHUSHANNA GOLD FIELD, ALASKA

When in Vancouver, British Columbia, at the end of August, Dr. D. D. Cairnes, of the Geological Survey of Canada, gave a meeting of business men of that city his impressions of the Shushanna district, Alaska, from which he had just returned. Dr. Cairnes has done much geological investigation work in the North country, chiefly in Yukon Territory, latterly in studying and mapping the geology along part of the 141st meridian (the Yukon-Alaska boundary), in accordance with an understanding arrived at between the United States and Canadian Geological Survey workers engaged in delimiting the International Boundary between Alaska and the Canadian Yukon. A published report of what Dr. Cairnes said in Vancouver, states that he spoke in a very cautious manner, and did not give the impression that the Shushanna is an exceptional field. He was careful to lay stress on the fact that the area in which gold had been found in that part of Alaska is small, and that all the ground had already been taken up. He was quoted as follows:

"It would be very foolish to go in there without a good outfit and prepared to spend the winter. It is absolute foolhardiness to stampede in there with the idea of getting out quickly. By this time there must be between one and two thousand men on the ground, and all the good ground was staked by the first 200 to get in.

"As to the strike itself—Mr. James told men that he first found gold on May 3. There is a story current that an Indian showed James where he could get gold, but I believe James found it himself. On July 4 they started sluicing and took out $300 a day per man. The diggings are shallow and gravel is not frozen. The creek bottoms are typical prospectors' diggings, and with a shovel and pan it is easy to establish the nature of the ground in an hour or two.

With the exception of that recovered by James, no great amount of gold has been taken out by any one as far as I am aware. The ground is staked for ten square miles, and this includes mountain tops. Practically everything between Johnson and Wilson Creeks has been taken up. Men going in after August 1 will find everything taken up around the strike, but there is a large country left to prospect. There are not many benches and the creeks are narrow. There is very little gravel on the benches, with the exception of the old channel of the Bonanza Creek."

Describing the geological conditions, Dr. Cairnes said that similar bedrock conditions prevail 25 miles away, on the Canadian side of the International Boundary ,and it is quite probable gold will also be found in the Canadian Yukon part of the district. He adds:

"The stampede has been greatly overdone. Undoubtedly it is the greatest stampede since that to the Klondike, but kindly note that I do not say it is the greatest strike since the Klondike. The trails are bad, with wet ground and a great amount of "niggerhead," but new trails are being constructed along the higher ground. We met many men who had very little idea of their position; one man was 15 miles from where he thought he was. Several parties were overdue when I left."

Dr. Cairnes states that the ground is at a high elevation and the creeks are practically all above timber line, but one gets the impression that it is low flat country, despite the fact that the average elevation is above 5,000 ft.

There are five routes into Shushanna—two from Alaska and three from the Canadian Yukon. The first Alaska trail is from McCarthy, but this is available only for eight to ten weeks in summer and is dangerous for pack animals. The other Alaskan route is from Fairbanks up Tanana River, and it is possible to get to the mouth of Johnson Creek by water, but it is very dangerous. Rivermen think that light-draft steamers can get to within 50 miles of Johnson creek.

Of the Canadian routes, there is one from Skagway to White Horse 110 miles, thence by wagon road to Kluane Lake 145 miles, then trail to Canyon City 130 miles; from that point to where Beaver Creek crosses the line and then into the diggings. Another route is by way of White Horse to Coflee Creek and thence to Canyon City or by way of Snag Creek. The latter is the shorter route and a new trail is being constructed, while road houses are being built at suitable places. Freight rate from Dawson City, Yukon, is $50 a ton, which Dr. Cairnes says is very reasonable.

Dr. R. W. Brock, director of the Geological Survey of Canada, who happened to be in Vancouver at the time, on his way to Dawson with an International Geological Congress excursion party, said that the whole country around Sushanna is favourable for prepecting, and added that he will not be surprised if some important discoveries are made in Yukon Territory and northern British Columbia within the next year or two. He also made reference to the proposed railway through Alaska, and stated that one of the few available routes is by way of Kluane Lake, White River and Tanana River.

A press despatch from Dawson is to the effect that the Canadian Customs Department has waived the restrictions on American goods crossing the Canadian Yukon to the diggings. Such goods in transit will be allowed to pass without the usual deposit, and where supervision shall be necessary to see that the goods are taken into United States territory the expense of convoy will be borne by the Canadian Customs. This arrangement has ben made by the Canadian Government on the recommendation of Yukon Commissioner Black and Dr. Alfred Thompson, member for Yukon in the Dominion House of Commons. No customs duty is being charged on Canadian goods being taken across the boundary line to the diggings.

## GRANBY CONSOLIDATED M. S. AND P. CO.

Mr. Geo. L. Walker included the following information concerning the Granby Consolidated Mining, Smelting and Power Co., Ltd., operating in British Columbia, in his "Weekly Copper Letter," published in the Bostoh Commercial last month:

"Granby completed, on June 30, a most successful fiscal year. Figures at hand indicate that it produced approximately 27,000,000 pounds of copper at a cost of 10½ to 10¾ cents a pound. If it was sold at an average of 15½ cents a pound the company must have earned between $7.50 and $8 a share on its outstanding 150,000 shares.

"The ores of Granby's original mines at Phoenix, B.C., from which all its production now comes, yield an average of only 17 to 18 pounds of copper and about 90 cents of gold and silver per ton. On a 15 cent metal market, therefore, these ores have a gross recoverable value of only $3.50 to $3.60 a ton. Economical and highly efficient management make it possible for Granby to treat this very low grade ore profitably.

It is a direct smelting, self-fluxing ore, and the total values recovered from a ton of it do not greatly exceed the single cost of smelting a ton of ore in some other districts. Granby mines its ore, pays 25 cents a ton freight on it to the smelter, smelts it, ships the copper to the Atlantic seabord, pays for refining and selling, and the cost of the whole operation is only about $2.70 per ton of ore handled during the year.

"It is the same management that is developing for the Granby Company its new mine the Hidden Creek, and building the smelter at Granby Bay, B.C. This mine and smelter are located together at tidewater, eliminating the 25 cent freight charge and some other expenses; but more important is the fact that Hidden Creek ore will yield approximately $6 a ton, or $2.50 in excess of that now being handled with good profit at Phoenix. The Hidden Creek property, therefore, promises to yield very large profits."

**THOS. W. GIBSON**

**Deputy Minister of Mines, Ontario**

## MINERAL PRODUCTION OF ONTARIO.

Returns made to the Ontario Bureau of Mines show that the production of the metalliferous mines and works of the province for the first six months of 1913 was as follows.

| | Quantity. | Value. |
|---|---|---|
| Gold, ounces | 106,091 | $2,171,147.00 |
| Silver, ounces | 13,890,692 | 7,693,713.00 |
| Copper, tons | 5,873 | 832,645.00 |
| Nickel, tons | 12,104 | 2,514,414.00 |
| Iron ore, tons | 62,627 | 141,324.00 |
| Pig iron, tons | 369,450 | 5,051,840.00 |
| Cobalt ore, tons | 79 | 7,374.00 |
| Cobalt oxide and Nickel oxide | 404,060 | 186,347.00 |

Compared with the first six months of 1912 these figures show the following increases:

| | |
|---|---|
| Gold | $1,935,949 |
| Copper | 96,176 |
| Nickel | 347,519 |
| Iron ore | 108,264 |
| Pig iron | 1,109,202 |

and the following decreases:

| | |
|---|---|
| Silver | $ 242,887 |
| Cobalt and nickel oxides | 5,726 |

**Gold.**—Most of the gold came from Porcupine, the chief producers being the Hollinger and Dome mines, both of which have been steadily at work. Porcupine Crown and McIntyre Porcupine also contributed. The other gold camps yielded about $150,000, including Swastika and Lucky Cross at Swastika, Cordova in Hastings County, Canadian Exploration at Long Lake, Northern Gold Reefs at Sturgeon Lake, Goldfields, Limited, at Larder Lake, and Tough-Oakes at Kirkland Lake. The narrow veins in the last named camp are proving to contain rich ore.

**Silver.**—The most productive mines for the half year were the Nipissing, Coniagas, La Rose, Kerr Lake, McKinley-Darragh-Savage, Buffalo and Crown Reserve, all mines which have held a leading place for years. Cobalt Townsite, Casey-Cobalt and Seneca Superior are coming into prominence as producers, while some properties, formerly in the first rank, are falling off in their yield. Shipments of ore were 3,216 tons, of concentrates 8,253 tons and of bullion produced at the mines 2,792,311 ounces. The corresponding figures for the first six months of 1912 were: Ore, 6,860 tons; concentrates, 4,806 tons, and bullion, 2,448,689 ounces, showing the progress being made towards complete treatment of the ore on the spot. Three mines in Gowganda and South Lorrain yielded 407,103 ounces.

**Nickel and Copper.**—The mines of the Sudbury District continue to increase their output, and the outlook is for still further production. The Canadian Copper Company and the Mond Company remain the sole producers of matte. Recent drilling operations have proven the existence of very large ore reserves. The Alexo mine, on the Porcupine branch of the T. and N. O. Railway is interesting, as being separated about 140 miles in a direct line from the Sudbury mines, and so proving the existence of ore quite outside the older field. The shipments are made to the Mond Company's new smelting plant at Coniston, which came into operation during the half year.

**Pig Iron.**—The production of pig iron in Ontario is growing rapidly. In 1902 it amounted to 112,687 tons; in 1907, 286,216 tons; in 1912 to 589,583 tons, and at the present rate of production, if maintained for the remainder of the present year, the output will be 738,900 tons. All the blast furnaces, except the one at Port Arthur, were in blast during the six months.

# PERSONAL AND GENERAL

Mr. C. F. Caldwell, manager of the company operating the Utica Silver Lead mine, in Ainsworth mining division, has returned to his headquarters at Kaslo, B.C., after having spent several weeks in the United States.

Mr. Wm. Fleet Robertson, of Victoria, provincial mineralogist for British Columbia, accompanied the International Geological Congress excursionists to Prince Rupert last month.

Mr. W. M. Brewer, who at the time was traveling in Lillooet district, investigating mining conditions for the British Columbia Department of Mines, lost his horse, which slipped off a trail and fell down a steep mountain side, fully one thousand feet. Fortunately Mr. Brewer was not riding the horse when the accident happened.

Mr. Bruce White has returned to Nelson, B.C., from a prospecting trip down the Athabaska river to Lake Athabaska and thence east into northwestern Saskatchewan. He told the Daily News of asphaltum, lime, salt, and natural gas resources of parts of the country passed through, and that there are as well lode metals—gold, copper, lead and nickel.

Mr. Jas. Buchanan, superintendent of the Consolidated Mining and Smelting Co.'s smelting works, has returned to Trail, B.C., from a holiday trip to Scotland.

Mr. W. L. Coulson, of Victoria, B.C., general manager of the Canadian Collieries (Dunsmuir), Limited, operating collieries on Vancouver Island, has been in Toronto. The Canadian Collieries Company is a Mackenzie & Mann enterprise.

Dr. D. D. Cairnes, of the Geological Survey of Canada, came down to Vancouver, B.C., from Yukon Territory last month to meet a north-bound party of International Geological Congress excursionists and accompany them to Dawson. Mr. R. G. McConnell, also of the Survey, was down from Rainy Hollow, in the extreme northwestern part of British Columbia, to take charge, as leader of the excursion to Prince Rupert, Skenna River, Malaspina and Yukon.

Mr. C. H. Macnutt left London on August 29th to take charge of the Burma Mines, Ltd., at Nantu, Burma.

Mr. A. A. Hassan has completed a report on the Moose-Head Gold Mine in Halifax County, Nova Scotia.

Mr. H. H. Lavery has joined the staff of the Mond Nickel Company at Worthington Mine.

Prof. A. P. Coleman injured his ankle as the result of slipping on a stone on a mountain trail while with the geological excursion in British Columbia in August. He has gone on to Alaska, however, with another excursion.

Mr. Reginald E. Hore has returned to Toronto after visiting mining districts of Alberta and British Columbia with the C2 excurison of the Geological Congress.

Mr. Neil Cochrane, an old-time mine superintendent in Rossland camp, recently visited Rossland after an absence of ten years. He is now superintendent of the Jumper Californian Gold Mines, Tuloumne County, California.

Mr. H. Hyman Claudet, for years representative in British Columbia of the Elmore Oil Process interests, was in London lately, after having completed the installation of an Elmore plant in Switzerland.

Mr. J. D. Galloway has been appointed acting assistant to the Provincial Mineralogist of British Columbia, and will do field work for the British Columbia Department of Mines during the remainder of the present year's field season.

Mr. Thos. Graham, chief inspector of mines for British Columbia, last month had a narrow escape from serious accident. Accompanied by Mr. James McGregor, district inspector, he was returning to Nelson after having visited the Silver King Mine, on Toad Mountain, when their horse bolted down the wagon road. Both men jumped from the buggy; Mr. Graham was not hurt, but Mr. McGregor had one ankle badly sprained. Shortly afterward the buggy was smashed and one horse was so badly injured that he had to be destroyed.

Mr. J. H. Cunningham, superintendent of the Canadian Collieries Co.'s colliery at Extension, Vancouver Island, had a somewhat strenuous time last month, having taken to the woods to escape the wrath of the strikers, who were indulging in the diversion of shooting and burning in and about the Extension mining camp. Mr. Cunningham's house and contents were utterly destroyed by fire. After a rough experience he found a place of safety in Victoria.

Mr. W. W. Leach, of the Geological Survey of Canada, who was to have been one of the guides in Western Canada, of an International Geological Congress excursion party, was prevented from doing so by an attack of typhoid fever.

Mr. Horace G. Nichols, who was for some time manager of Ymir gold mine, in British Columbia, and since then has had his headquarters in London, England, was expected to leave that city in July on a business trip to the United States and Canada. Lately he joined the firm of Bainbridge, Seymour & Co.

Mr. W. W. Mein, of New York, consulting engineer for the Canadian Mining and Exploration Company, was in Hedley camp, Similkameen, B.C., in the early part of August. He was accompanied by his assistant, Mr. Ralph S. G. Stokes, formerly mining editor of the Rand Daily Mail, Johannesburg, South Africa.

Dr. Heinrich Ries, professor of geology at Cornell University, Ithaca, New York, is in the West, continuing his investigations into the clay resources of Canada, which work he is doing for the Geological Survey of Canada.

Mr. Wm. Thomlinson, of New Denver, B.C., has been engaged for a couple of months in getting together specimens of the ores of Slocan district, for use in representative collections of the ores and minerals of British Columbia the Provincial Department of Mines is having prepared for permanent exhibition in suitable places.

Mr. E. E. Ward has retired from the office of superintendent of the Silver Hoard mine, in Ainsworth camp, B.C.

Mr. Ed. Dedolph, for some time engaged in the metallurgical laboratory at McGill University in connection with zinc ore reduction experiments, that have been conducted there under the direction of the Mines Branch of the Canada Department of Mines, is now in British Columbia, Dr. Haanel having arranged to continue the experiments at the electro-thermic works at Nelson, for some time operated experimentally by the Canada Zinc Company.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Metal mining is being continued in the province with very little interruption. Hydraulicking in the placer-gold districts has been practicable to a later date than is usual in ordinary seasons, so a proportionately large increase in the quantity of placer gold recovered this year is looked for. Generally speaking, lode mining is being carried on in the older mining camps. The only serious decrease in mineral production looked for is in connection with coal mining, and this on Vancouver Island, where labor troubles have occasioned much bitterness, and unfortunately with no present prospect of a settlement.

**Ainsworth.**—The following information concerning the Silver Hoard mine, in Ainsworth camp, has been given to the Kaslo Kootenaian by Mr. W. S. Hawley, managing director of the company owning and operating that mine: "As a result of having found a larger and better orebody at the 100-ft. level than we had at the 50-foot, and the encouraging outlook generally, the company has decided to sink a double-compartment shaft on the Silver Hoard to a depth of 500 ft., which will be 400 ft. deeper than the lowest present level on the property. With this end in view surveys are being ing made and preliminary work is to be commenced at once. A compressor, to be driven by water from the north fork of Cedar Creek, is to be installed, and this will supply all the power that will be required for drilling and hoisting. This compressor, by the way, will be of a somewhat new design and principle; it was designed by Prof. Francis A. Thompson, head of the mining engineering department of the State College of Washington, Pullman, Washington.

**Kaslo.**—The Lardo correspondent of the "Kootenaian" says: "The mining outlook along the Lardo branch is steadily improving and prospects have not been so encouraging for a long time. Prospectors and claim owners are active and the indications are that capital will soon be more readily available with which to develop the many promising locations."

Grading on the Kaslo & Slocan railway line, which is being changed from narrow to standard gauge, is likely to be completed by November 1, according to the contractor for the work. Most attention has been given during the summer to completion of the work from Whitewater, a few miles down toward Kaslo, for the altitude of that part being higher snow falls earlier than nearer Kaslo. It is hoped steel will be laid part of the way between Whitewater and South Fork before the snow shall commence to fall, for it will then be practicable to haul freight in and out between Three Forks and South Fork pending completion of the line through to Kaslo.

**Sandon.**—Several Slocan mines that had not shipped ore for a number of years lately commenced to send ore to Sandon for shipment by railway and steamer to the smelting works at Trail. The Last Chance aerial tramway having been put in running order, after a long period of non-use, is being utilized for conveyance of ore from the Surprise mine down to the lower terminal below Cody, whence hauling is done by teams. The outlet for the Surprise is now through one of the old Last Chance adits, connection having been made by a long extension of the adit and then a raise of more than 800 feet. Ore is also being received at the Sandon railway depot from the Wonderful mine, at which years ago much galena was recovered by ground-sluicing. Underground work has resulted in the vein on the Wonderful being found and now ore is being mined from it.

**New Denver.**—The Slocan Record states that the work of driving No. 8 adit on the Standard, near Silverton, Slocan Lake, has been commenced. This adit is on one of the old Emily Edith group of mineral claims, now owned by the Standard Silver-Lead Mining Co., No. 7 adit, on the same property will have to be driven about 400 feet more before it will be under the big orebody occurring on levels Nos. 6 and 5. Ore is being mined in a stope that has been opened from No. 5 level, which stope has been advanced about 50 feet, and still has 6 feet of shipping ore in the face. The ore contains about 80 per cent. lead, and some zinc, and averages 156 oz. silver to the ton. Other stopes, both above and below No. 5, are also yielding shipping ore.

**Silverton.**—The Van-Roi mine report for the month of July shows that little more was concentrated in that month, milling operations having been temporarily suspended on July 9. Only 143 tons of ore was milled; its average assay was 3.7 oz. silver per ton, 0.1 per cent lead, and 3.5 per cent. zinc. The metals recovered were half a ton of lead concentrate and two tons of zinc concentrate; the former contained 117 oz. silver per ton, 54.6 per cent. lead, and 10.3 per cent. zinc; the latter contained 35.3 oz. silver per ton, 3.4 per cent. lead and 38.2 per cent. zinc. The west drifts on levels Nos. 7 and 9 were extended and the raise from level No. 9 was advanced 22 ft. Diamond drilling was continued from No. 9 level and holes from both 1,250 and 1,510 feet from portal reached the vein.

**Rossland.**—Le Roi No. 2, Ltd., has published the following report for July from its Josie mine: Shipped 1.570 tons of ore and 103 tons of concentrate. The receipts from the smelter were $23,530, being payment for 1,695 tons of ore shipper, and $1,138 for 145 tons of concentrate; total receipts, $24,668. Estimated costs for corresponding period were: Development $7,-700, ore production $8,300, milling $1,500, total $17,-500. Summarized, the development work done was 173 ft. on the 500-ft. level, 40 ft. on the 700-ft. level, and 199 ft. on the 900-ft. level. The highest grade ore opened was that on the 700-ft. level where the average for a width of 16 in. along 30 ft. was 16 dwt. gold per ton, and 6.25 per cent. copper.

Arrangements have been made under which Mr. W. R. Foley, of Denver, Colorado, and associates will operate the Blue Bird mine, in the South Belt of Rossland camp. This mine was worked for some time by Mr. Lyman Carter, but under unfavourable conditions financially. Some 20 cars of ore was shipped to Trail. As depth was gained copper largely replaced silver and lead in the ore.

**Boundary.**—The Granby Consolidated Co., has declared a dividend of $1.50 per share, payable on September 2.

The Ledger says there are 40 men working at the Jewel gold mine and stamp mill, and the production of ore is about 50 tons a day.

A commencement has been made to haul ore from the Union claim, in Franklin camp, North Fork of Kettle river, to the railway terminus at Lynch creek, where 12 tons of gold-silver ore was lately delivered. This is the first ore shipped in commercial quantity from Franklin camp.

The Granby Consolidated Co. is reported to have bonded the Big Copper property, situated about five miles west of Greenwood, and to intend to do some diamond drilling on it.

A. E. Watts, a well-known lumber mill man of East Kootenay, and F. N. Knight, both connected with the management of the Boundary Mining and Exploration Co., were recently charged with five infractions of the Coal Mines Regulation Act. For failing to report to the Department of Mines that a man had been burned by gas in the company's coal prospect workings near Midway. Watts was fined $75 and Knight $25, both with costs. Watts has appealed against the infliction of this penalty. On four other charges Watts was fined $1 each, without costs. Similar charges against the others were withdrawn. Watts at first disregarded a summons to appear at Midway to answer the charges but after a bench warrant had been issued for his arrest thought it best to put in an appearance. A minority of the shareholders are much dissatisfied with the present condition of the company's affairs.

Advices from New York state that the preliminary report of the Granby Consolidated M. S. and P. Co., for the fiscal year ended June 30, 1913, shows that the profits from the company's Phoenix mines and Grand Forks smeltery amounted to $1,207,661, of which the sum of $449,955 was distributed among shareholders since dividend payments were resumed recently. These figures are subject to minor corrections by the final statement to be submitted at the annual meeting of shareholders to be held in New York on October 7, proximo. The earnings for July and August will show some shrinkage, due to low copper prices and somewhat small recoveries, but the total for the year will reach approximately $1,250,000, it is believed, as compared with $1,600,000 for the previous twelve month period.

In a circular letter to the shareholders, which will be mailed with the dividend cheques for the second quarterly disbursement on September 2, President W. D. Nichols has included the greater part of the engineer's reports on the company's Hidden Creek property, compiled recently, that shareholders may be kept in touch with the progress of the work there.

"Construction work is progressing with remarkable rapidity," says President Nichols. "Inspection from August 3 to August 10 shows that the ground for the buildings at Hidden Creek is all cleared; steel frame for main smeltery building erected; foundations for the flue chamber completed; the machine shop finished and being used; and smeltery warehouse being erected. The mine development is in advance of the demand and ore shipments can be begun at any time. Our engineers estimate that 7,000,000 tons of ore is now in sight within the developed area."

**Vancouver.**—Preparations are being made for as large a display of specimens of minerals as it shall be found practicable to get together. Many mining camps have sent in collections of ores, and the Provincial Department of Mines is making a comprehensive exhibit.

Mining is in progress on several properties in the mountains near Howe Sound, but only the Britannia is making a production of ore of any importance, the work on other properties being either prospecting or development.

**Nanaimo.**—Owing to the destruction of property at the Extension coal mines of the Canadian Collieries (Dunsmuir) Limited, and the violence of striking miners and their sympathizers, the whole of the Nanaimo-Extension coal mining district has for two weeks been guarded by militia men, whose presence has been made necessary by the excesses of those who for several days committed many unlawful acts. About 150 men have been arrested and charged with various breaches of the law—assault, unlawful assembly, possession of stolen property, or other offences. It is probable the Extension mines will shortly be worked again, only surface buildings and plant having been destroyed by fire, and all danger of a repetition of the recent disorders having passed. The Western Fuel Company is flooding, from the sea, the southern and most important part of its No. 1 mine, at Nanaimo, to either extinguish underground fire that has gained much headway since the miners ceased work at the end of April, or seal off that large and hitherto productive section of the mine workings of that mine. Local newspapers state that serious effects of the strike will be felt by business men of both of the coal-mine towns, Nanaimo and Ladysmith, for a long while.

**Granby Bay.**—Much machinery, plant and material is being received for use in construction and equipment of the smelting works of the Granby Consolidated Mining, Smelting and Power Co., Ltd., is establishing at this place, and in providing for mining ore on a large scale, also for shipping accommodation. The company is hastening construction and equipment work as much as possible while the weather continues favourable, so as to get well forward toward completion before the winter shall set in, and outdoor work be done only under difficulty.

**New Hazelton.**—Smelter returns from 282 tons of ore shipped from the Silver Standard mine, situated a few miles from Hazelton, to the Consolidated Mining and Smelting Co.'s smelting works at Trail, B.C., give the fololwing metal recoveries: Gold, 63.323 oz.; silver, 40.883.28 oz.; lead, 149.525 lbs. The net value of the whole was $30,000.61, or $106.42 a ton after payment of freight and treatment charges. Other properties are making small shipments of ore, but generally for test purposes. In most cases development work only is being done, facilities for transportation of ore from mines to railway not yet having been provided By next year the present temporary freight tariff will have been replaced by a regular, and it is expected a lower tariff, after which production and shipment of ore will be undertaken by a number of mine-owners not yet ready to make an output.

## PORCUPINE, WEST SHINING TREE AND SWASTIKA

**Enlarging Dome Mill.**—Work has been started on the excavations for the 40 stamp addition to the Dome mill. The new addition to the mill is being erected at the west end of the present building, where the forty stamps are now treating over 400 tons daily. The new building will be 130 feet by 75 feet. With the addition to the mill the practice will be slightly altered, so that it will approximate even closer to the Home-stake. The new plant will consist of 40 stamps, Dorr classifiers, 3 Dorr thickeners, 4 sets of Merrill cones, 4 sets of plates, a couple of storage tanks, 3 pumps, 3 Merrill presses and 6 40 by 10 leaching tanks. The whole building will be of steel. The force of men has been increased. All the machinery has been ordered, as it is expected that the building will be roofed in before the snow flies. The addition should be in operation early in 1914.

**The Kerr Lake Mining Company** has examined the Hollinger Reserve property in Porcupine and thoroughly sampled the same. But no purchase or option has yet been negotiated, though it is quite possible that it may be.

**Rea Mine.**—So satisfactory was the mill run at the Rea mine that the directors of the Leasing and Exploration Company have decided to add another five stamps at once. During the 19 days in July that the five stamp mill was in operation treating dump ore, a return of $3,000 was made, and for the experimental run the directors were quite pleased. The Leasing and Exploration Company has an option on a royalty basis, on the Rea.

**West Shining Tree.**—Largely owing to the systematic work on claims owned by Mr. R. J. Denison and his associates there is quite a rush into the West Shining Tree district. The best claims all lie round Wasabika Lake, and it is estimated that about 300 men are encamped on its shores or near it. There is not much free gold found on the claims worked by the Denison syndicate, but the assays from the devitrified quartz are very encouraging and quite uniform. The district was first staked in the months of July and August, 1911, largely by Gowganda prospectors. But that was before Porcupine had demonstrated the possibilities of gold in Northern Ontario, and the original stakers did little work and received very poor backing. Many claims were allowed to lapse and nothing or little was heard of the district for years. The prospectors now have to pack in their supplies from Ruel, on the Canadian Northern, but a wagon road is now being cut by the Government and should be available this winter. If the camp demonstrates its importance, it will be easy for the Canadian Northern to run a spur into the new gold camp.

**Alexo Nickel Mine.**—The shipments from the Alexo nickel mine for the month of August will be about 800 tons. This has all gone to the Mond Nickel Company at Coniston. The open cut is down 60 feet and is about 40 feet long. At the bottom of the working there is four feet of massive ore, which will run about 8 per cent. The disseminated ore on one side of the vein is as high as 3 per cent. for the width of the open cut. There is little or no nickel in the other wall.

**Dixon Mine.**—The Timmins, McMartin and Dunlop syndicate has commenced work in earnest on the Dixon property at Porcupine. The shaft is now 200 feet, and it will be carried to 500 feet without cross-cutting at intervening levels. The Hollinger Mining Company has been granted a contract for the work on the Dixon. The Dixon will be explored from the Hollinger. Wherever the Hollinger veins are found to continue into Dixon property they will be followed and developed.

**Pearl Lake.**—A shoot of high grade ore has been struck on the Pearl Lake twenty feet above the 400 foot level in a raise.

**McEnaney.**—Owing to the stoping of some remarkable ore at the 100 foot level, the little stamp mill at the McEnaney mine produced about $50,000 in the month of August. The ten stamp mill has therefore already produced $165,000. The block of ground which enables the little mill to show such good returns in August was at the 100 foot level. For 23 feet in the drift the ore was taken out for a width of six and a half feet, and over this width it ran $130 to the ton. This helped the general average of the mine very materially.

**Kirkland Lake.**—A good discovery has been made on the Bagshaw claims at Kirkland Lake. These claims lie between Mud and Gull Lakes. They are owned jointly by Robertson and T. Montgomery. The vein is about twelve inches wide and has been stripped for sixty feet.

**Hollinger Mine.**—At the 400 foot level ten feet of good ore has been cut at the Hollinger mine. The vein was cut from the winze sunk from the 300 foot level. The drift will be continued from the point where the ore body was struck, to a point under the main, and a rise put through to the 300 foot level. Then sinking operations will be resumed. By the end of the year it is expected to have the main vein at a depth of 550 feet.

**Burnside.**—On the Burnside property at Kirkland Lake the vein dipped from the shaft at 50 feet. A cross-cut has been started at the 100 foot level to pick up the vein. It is estimated that from its dip it should be cut at not much more than fifteen feet. Camps are now being built for the winter campaign on the Burnside. Five thousand feet of surface work has been done this summer.

Two hundred feet north of the southern boundary a twelve inch vein has been cut which shows free gold.

## COBALT, GOWGANDA, AND SOUTH LORRAIN

**McKinley-Darragh-Savage.**—Another of the regular Cobalt dividend payers has cut its regular rate of payment. After paying 176 per cent. the McKinley-Darragh-Savage has cut its bonus from 7 per cent. to 3 per cent. The company is still paying at the rate of 6 per cent., or 3 per cent. regular and 3 per cent. bonus. The McKinley-Darragh, with its October payment, has distributed $4,097,832. There should be no great surprise among shareholders at the announcement. For the last two annual meetings the president of the company has given notice that unless some unexpected good fortune arrived the company would soon have to cut their high rate. The company has now merely arrived at a point where exploration will be higher in comparison with silver production, as it is fast becoming all over the camp. In making the announcement of the cut the treasurer said: "Owing to extensive explorations, which have resulted in the discovery of valuable deposits in the McKinley mine, and indications of a considerable addition to reserves in the Savage mine, and to the cost of a large addition to the concentrating plant, the accumulated surplus, as shown by the statement of January, 1913, has been considerably reduced, in order to maintain the standard of credit and efficiency of the company, the directors have decided to restore and maintain the usual substantial surplus, and therefore reduced the rate of bonus to be divided, as present conditions indicate a continuation of this rate of distribution for a considerable period." As a commentary upon this statement, it is significant to state that the McKinley production jumped from 185,182 ounces in June to 224,628 ounces in July. Several good shoots of high grade ore were discovered and worked.

**Buffalo.**—As an offset to this cut in dividend rate the Buffalo mines have increased their bonus. The directors added 15 per cent. to the regular five per cent. due on October 1st, with 4 per cent. more added to the usual 3 per cent. dividend in November, making a total of 27 per cent. declared at one time. The Buffalo has been on a 32 per cent. per annum basis, but from time to time have added a bonus to the regular dividends. This year has surpassed all others, as the Buffalo had a remarkable surplus, and 57 per cent. has been added to the regular dividend. On January 1st an 18 per cent. bonus was added to the regular 5 per cent., giving a total dividend of 23 per cent. For the second quarter of the year a 15 per cent. bonus was added, making a 20 per cent. dividend, falling due on April 1st, with the 3 per cent. in May. The Buffalo's total for the year is brought to 89 per cent., or a total of $890,913.

**Nipissing.**—During the month of August the Nipissing mined ore of an estimated net value of $222,260 and shipped bullion of an estimated net value of $330,-526. During the month the high grade mill treated 171 tons of ore, and the refinery shipped 553,698 ounces of bullion. The low grade mill yielded 7,824 tons, an average of over 260 tons per day.

While no new veins were found either on the surface or underground, the development of known ore bodies continues to be quite satisfactory. Most of the month's production continued to come from shafts 73, 80 and 63. At all other places most of the work consisted of exploration. The hydraulic was working to the east of shafts 27 and 19. Several seams were uncovered, but these contained no ore at the surface. The diamond drill is working in the diabase on R. L. 408, near the Nova Scotia mine. One hole has a depth of 613 feet. Nothing favourable was encountered. The drill is now on the second hole endeavouring to cut a small vein assaying 150 ounces in silver, found on the surface several years ago by trenching.

**Geological Congress Visitors.**—The last of the geologists have seen the North and departed. There can be no doubt of the impression the silver camp made upon them. One German scientist, belonging to Party C6, said at the reception given in their honour, that the chief difference between Cobalt and Saxony was that Cobalt had the ore and Saxony the rock and the tenor of all the speeches of the Teutons was that Cobalt was yet in its infancy. They, too, they declared, had had high grade ore, but it had been mined out generations ago.

The last party contained the Minister of Mines, the Hon. Louis Coderre. Mr. Coderre made a good impression upon all the mining men he met by his evident interest in all he saw, and his sincerity in intending to make the portfolio of Minister of Mines a more important one that it has been heretofore. He frankly admitted that he knew nothing whatever about mining; but was quite willing to learn.

**Crown Reserve.**—A new ore shoot has been discovered on the north vein of the Crown Reserve. It is two and a half to three inches of high grade ore, and it was developed at the 50 and 140 foot levels. On August 29th the big turbine pumps on the raft near the Kerr Lake No. 7 shaft began to work, and good progress has already been made with the big project of draining the lake.

**Hudson Bay Mine.**—The production of the Hudson Bay mine for the month of July was 36,484 ounces, practically the same as the preceding month. The greater part of this production came from the mill. The mill ran 24 days and treated 1,784 tons, the daily average being 74.30 tons. The heads ran 22.2 ounces and tails ran 2.9 ounces. The extraction was 87.30 per cent. The buildings to replace those destroyed by fire have been completed. At camp No.2 the long drift connecting No. 1 and 2 shafts has broken through. This cross-cut is 780 feet in length and cuts the Cobalt Lake fault. It was started from the 100 foot level of the No. 1 shaft. The vein on the fault did not hold any very encouraging values.

**Nipissing Bullion.**—A bullion shipment, which is claimed as a world's record, was made last month by the Nipissing. It contained 212 bars of bullion, 257,-425 ounces, $152,524. On the same day the Buffalo also made a large consignment of bullion, the total for the two mines being 397,827 ounces, $235,361.

**O'Brien.**—By adding another tube mill the O'Brien mill has raised its capacity from 100 to 150 tons. No change is being made in the treatment.

**Earlton.**—A calcite vein showing native silver has been made in Cain township, between Earlton, on the T. and N. O. main line and Elk Lake. The outcrop of rock above the clay is meagre. No work has been done on the narrow calcite vein, which shows native and cobalt bloom. Quite a number of claims have been staked wherever it was possible to find rock.

**Elk Lake.**—In the Elk Lake camp some fine high grade ore is being taken off the Curry claim. The Forest City Mining syndicate struck good high grade ore at a depth of 30 feet sinking on a strong niccolite vein.

# STATISTICS AND RETURNS

## B. C. ORE SHIPMENTS.

Shipments of ore from Kootenay and Boundary mines to Trail smelter for the week ending Aug. 30 totaled 6,454 tons, making a total for the year to date of 241,527 tons.

In the Slocan district the foremost shippers were the Standard, 74 tons; the Utica, 30 tons, and the Eastmount, 29 tons. The No. 1 at Ainsworth shipped 141 tons and the Silver Hoard in the same camp sent out a shipment of 48 tons. In the Nelson district the heaviest producer was the Yankee Girl at Ymir, which shipped 131 tons. Production in detail was:

**Consolidated Co.'s Receipts, Trail.**

| | | |
|---|---|---|
| Knob Hill | 52 | 1,706 |
| Ben Hur | 429 | 8,820 |
| Bonanza | 47 | 94 |

| | | |
|---|---|---|
| Standard | 74 | 9,151 |
| Eastmount | 29 | 209 |
| Utica | 30 | 209 |
| Silver Hoard | 48 | 606 |
| No. 1 | 141 | 2,131 |
| Yankee Girl | 131 | 3,445 |
| Emerald | 34 | 786 |
| Centre Star | 2,895 | 97,425 |
| Le Roi | 1,765 | 38,618 |
| Le Roi No. 2 | 376 | 14,392 |
| Inland Empire | 25 | 50 |
| Sullivan | 378 | 23,601 |
| Other mines | ... | 40,116 |
| Ttal | 6,454 | 241,527 |

**Nelson.**

| | | |
|---|---|---|
| Yankee Girl | 131 | 3,445 |
| Emerald | 34 | 786 |
| Queen, milled | 350 | 9,725 |
| Mother Lode, milled | 500 | 13,000 |
| Second Relief, milled | 150 | 4,600 |
| Other mines | 150 | 21,265 |
| Total | 1,165 | 52,821 |

**Lardeau.**

| | | |
|---|---|---|
| Other mines | ... | 332 |

**Rossland.**

| | | |
|---|---|---|
| Centre Star | 2,895 | 97,425 |
| Le Roi | 1,765 | 38,618 |
| Le Roi No. 2 | 376 | 14,392 |
| Inland Empire | 25 | 50 |
| Le Roi, mid | 325 | 11,298 |
| Other mines | ... | 174 |
| Total | 5,661 | 165,432 |

**East Kootenay.**

| | | |
|---|---|---|
| Sullivan | 378 | 23,601 |
| Other mines | ... | 1,003 |
| Total | 378 | 24,604 |

**Slocan and Ainsworth.**

| | | |
|---|---|---|
| Standard | 74 | 9,151 |
| Eastmount | 29 | 209 |
| Utica | 30 | 377 |
| Silver Hoard | 48 | 606 |
| No. 1 | 141 | 2,131 |
| Standard, milled | 1,000 | 33,000 |
| Rambler-Cariboo, milled | 300 | 8,000 |
| Bluebell, milled | 1,400 | 46,723 |
| Other mines | ... | 30,145 |
| Total | 3,022 | 131,142 |

## COBALT ORE SHIPMENTS.

The ore shipments for the week ending Sept. 6, are:

| Mine. | High. | Low. | Pounds |
|---|---|---|---|
| Coniagas | 5 | .. | 431,365 |
| Trethewey | 2 | .. | 95,430 |
| Cobalt Comet | 1 | .. | 86,080 |

The shipments from the Cobalt camp for the year to Sept. 6, are:

| Mine. | High. | Low. | Tons. |
|---|---|---|---|
| Bailey | 5 | 1 | 158.15 |
| Beaver | 8 | .. | 237.43 |
| Chambers-Ferland | 3 | 4 | 223.77 |
| City of Cobalt | 4 | .. | 105.14 |
| Cobalt Townsite | 46 | .. | 1,637.34 |
| Cobalt Lake | 22 | .. | 736.66 |
| Buffalo | 2 | .. | 66.13 |
| Coniagas | 37 | .. | 1,368.23 |
| Crown Reserve | 15 | .. | 429.93 |
| Cobalt Comet | 15 | .. | 451.72 |
| Green-Meehan | .. | 1 | 12.96 |
| Hudson Bay | 12 | .. | 441.27 |
| Kerr Lake | 16 | 1 | 509.11 |
| La Rose | 38 | 4 | 1,772.10 |
| McKinley-Darragh | 50 | .. | 1,720.17 |
| Nipissing | 2 | 41 | 1,259.78 |
| O'Brien | 10 | .. | 371.18 |
| Seneca-Superior | 6 | 3 | 310.51 |
| Silver Cliff (Orion) | 2 | .. | 48.05 |
| Trethewey | 10 | 8 | 486.38 |
| Timiskaming | 11 | 1 | 362.64 |
| Casey Cobalt | 5 | .. | 341.00 |
| Colonial | 1 | .. | 21.56 |
| General Mines | .. | 1 | 8.80 |
| Silver Queen | .. | 2 | 169.89 |
| Wettlaufer | .. | .. | 122.26 |
| Miller Lake O'Brien | 2 | .. | 47.19 |
| Right of Way | 1 | 1 | 62.71 |
| Penn-Canadian | 4 | .. | 126.13 |
| Silver Bar | .. | 1 | 20.00 |
| Mann | 1 | .. | 20.00 |
| York Ontario | 3 | .. | 65.72 |
| Miscellaneous | 2 | .. | 83.08 |
| Total | 333 | 69 | 18,641.76 |

The bullion shipments for the week are:

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Buffalo | 65 | 66,694.00 | 40,000.00 |
| Nipissing | 112 | 135,127.67 | $80,400.96 |
| | 177 | 201,821.67 | $120,400.96 |

The bullion shipments for the year to Sept. 6 are:

| Mine. | Ounces. | Value. |
|---|---|---|
| Nipissing | 4,038,734.63 | $2,333,808.31 |
| Penn-Can. | 14,141.60 | 8,456.90 |
| Buffalo | 1,125,261.90 | 701,801.57 |
| C. Reserve | 315,266.00 | 193,609.25 |
| Dom. Reduc. | 352,183.40 | 203,277.15 |
| Townsite | 10,909.00 | 6,647.00 |
| Miscellaneous | 3,920.00 | 1,623.00 |
| Timiskaming | 25,561.70 | 14,948.04 |
| O'Brien | 118,309.77 | 61,998.66 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 13,529.83 | 8,282.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 24,226.79 | 14,936.84 |
| Bailey | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| Totals | 6,079,077.32 | $3,575,526.76 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

Toronto, Ont., Sept. 8, 1913

| New York Curb. | Bid. | Ask. |
|---|---|---|
| American Marconi | 5.12½ | 5.50 |
| Alaska Gold | 18.75 | 19.00 |
| British Copper | 2.25 | 2.50 |
| Braden Copper | 6.75 | 7.00 |
| California Oil | 182.00 | 185.00 |
| Chino Copper | 44.75 | 45.00 |
| Giroux Copper | 1.25 | 1.50 |
| Green Can. | 6.75 | 7.00 |
| Granby Copper | 75.25 | 75.75 |
| Miani Copper | 23.37½ | 23.50 |
| Nevada Copper | 17.87½ | 18.00 |
| Ohio Oil | 275.00 | 280.00 |
| Ray Cons. Copper | 20.50 | 20.62½ |
| Standard Oil of N. Y. | 152.00 | 154.00 |
| Standard Oil of N. J. | 369.00 | 371.00 |
| Standard Oil (old) | 1100.00 | ...... |
| Standard Oil (subs.) | 725.00 | ...... |
| Tonopah Mining | 4.87½ | 4.93¾ |
| Tonopah Belmont | 7.00 | 7.12½ |
| Tonopah Merger | .73 | .74 |
| United Cigars, com. | 93.75 | 94.00 |
| United Cigars, pfd. | 110.00 | 120.00 |
| Inspiration Copper | 15.75 | 15.87½ |
| Goldfield Cons. | 1.87½ | 1.93¾ |
| Yukon Gold | 2.00 | 2.12½ |

| Porcupine Stocks. | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .01 |
| Crown Chartered | .00⅜ | .00½ |
| Dome Extension | .05½ | .06 |
| Dome Lake | .22 | .24 |
| Dome Mines | 12.00 | 14.00 |
| Eldorado | ... | ... |
| Foley O'Brien | .20 | .24 |
| Hollinger | 15.75 | 16.25 |
| Jupiter | .17 | .19 |
| McIntyre | 2.25 | 2.60 |
| Moneta | .03 | .04 |
| North Dome | ... | .40 |
| Northern Exploration | .50 | .75 |
| Pearl Lake | .33¼ | .34 |
| Plenaurium | .50 | 90 |
| Porcupine Gold | .09 | .10 |
| Imperial | .01¼ | .02 |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .01½ | .02 |
| Rea | .15 | .25 |
| Standard | ... | ... |
| Swastika | .03¾ | .04 |
| United | ... | ... |
| West Dome | .10 | .15 |

| Cobalt Stocks. | Bid. | Ask. |
|---|---|---|
| Bailey | .05½ | .06 |
| Beaver | .32 | .34 |
| Buffalo | 2.45 | 2.60 |
| Canadian | .20 | .22 |
| Chambers Ferland | .15 | .17 |
| City of Cobalt | .45 | .50 |
| Cobalt Lake | .45 | .50 |
| Coniagas | 6.90 | 7.05 |
| Crown Reserve | 1.70 | 1.75 |
| Foster | .03 | .05 |
| Gifford | .03 | .04 |
| Gould | .02¾ | .03 |
| Great Northern | .09 | .10 |
| Hargraves | .03 | .04 |
| Hudson Bay | 70.00 | 80.00 |
| Kerr Lake | 3.45 | 3.60 |
| La Rose | 2.25 | 2.30 |
| McKinley | 1.48 | 1.50 |
| Nipissing | 8.95 | 9.10 |
| Peterson Lake | .21¼ | .22 |
| Right of Way | .03½ | .05 |
| Rochester | .03 | .04 |
| Leaf | ... | .03 |
| Cochrane | .25 | .50 |
| Silver Queen | .03 | .04 |
| Timiskaming | .24½ | .25 |
| Trethewey | .24 | .28 |
| Wettlaufer | .15 | .17 |
| Seneca Superior | 2.20 | 2.50 |
| Porcupine Crown | 1.20 | 1.60 |

## TORONTO MARKETS.

Sept. 9.—(Quotations from Canada Metal Co., Toronto).

Spelter 5 cents per ponnd.
Lead, 5.75 cents per pound.
Tin, 45½ cents per pound.
Antimony, 9½ cents per pound.
Copper, casting, 17 cents per pound.
Electrolytic, 15¾ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Sept. 9—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $19.20 (f.o.b. Toronto).
Midland No. 2, $19.00 (f.o.b. Toronto).

Sept. 9—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, $7.50 per ton.
Coal, bituminous, lump, $5.00 per ton.

## GENERAL MARKETS.

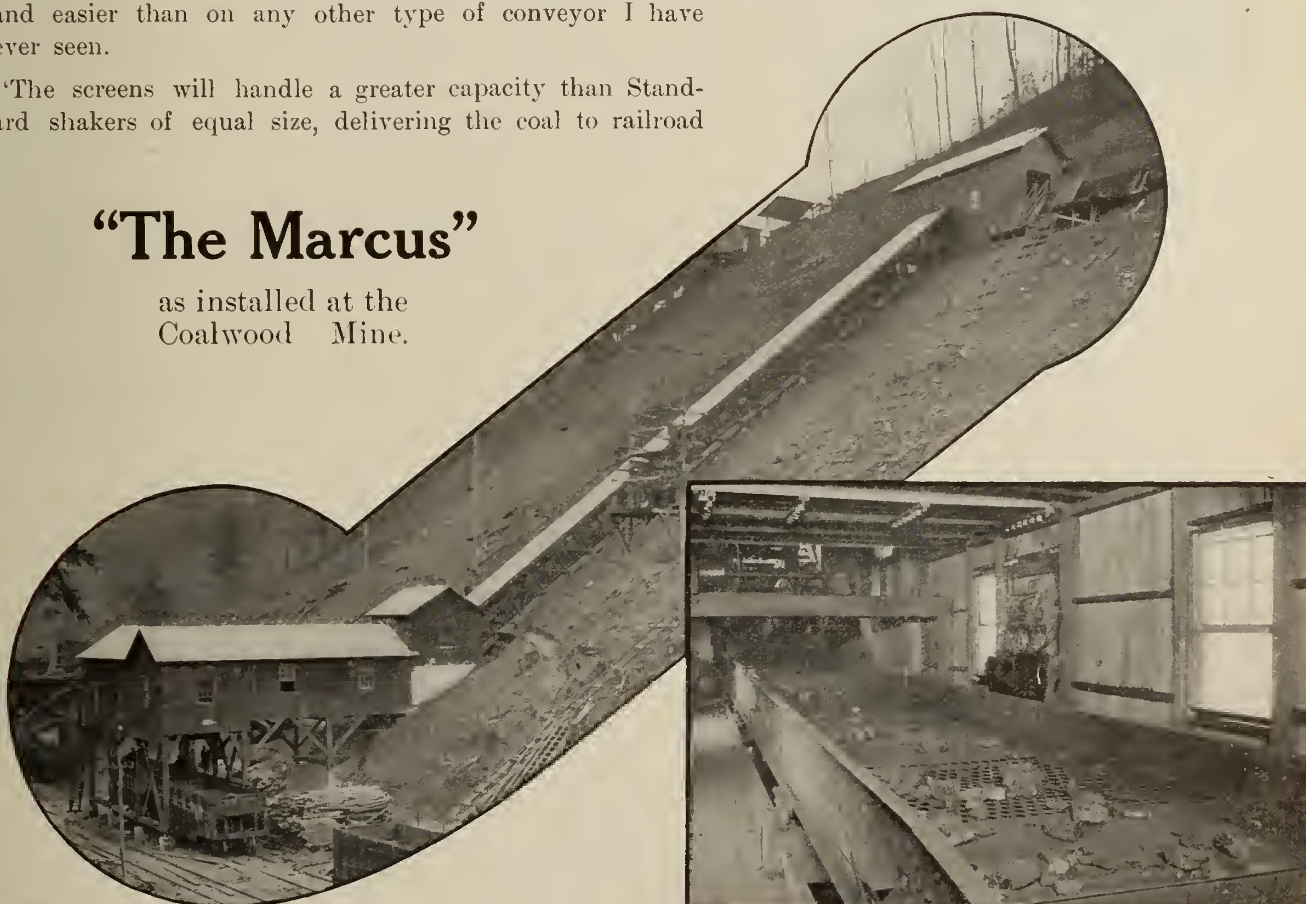
Sept. 5—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $3.00 per ton.

Sept. 5—Tin, straits, 43.25 cents.

Copper, Prime Lake, 16.62½ to 16.75 ecnts.
Electrolytic Copper, 16.37½ to 16.50 cents.
Copper wire, 17.50 to 17.75 cents.
Lead, 4.80 cents.
Spelter, 5.90 cents.
Sheet zinc, (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 8.30 cents.
Aluminum, 21.50 to 22.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $44.50 to $45.00 per ounce.
Platinum, hard, $50.00 to $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $39.00 per 75-lb. flask.

| SILVER PRICES. | New York. cents. | London. pence. |
|---|---|---|
| Aug. 23 | 59½ | 27 7/16 |
| " 25 | 59¾ | 27 9/16 |
| " 26 | 59½ | 27 7/16 |
| " 27 | 59½ | 27 7/16 |
| " 28 | 58⅝ | 27½ |
| " 29 | 59⅝ | 27½ |
| " 30 | 59½ | 27½ |
| Sept. 1 | holiday | 27½ |
| " 2 | 59⅝ | 27 9/16 |
| " 3 | 59⅝ | 27 9/16 |
| " 4 | 59⅝ | 27 9/16 |
| " 6 | 59½ | 27½ |
| " 8 | 59⅝ | 27 9/16 |
| " 9 | 59⅝ | 27 9/16 |
| " 10 | 59¾ | 27⅝ |



# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

**Dominion of Canada.**

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Astley, J. W.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, D. L. H.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
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Segsworth, Walter E.
Smith, Alex H.
Tyrrell, J. B.
Willmott, A. B.

**Quebec**

Cohen, S. W.
DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Ross, J. G.
Woolsey, W. J.

**British Columbia**

Ashworth, James
Fowler, S. S.

**FOREIGN-New York**

Hassan, A. A.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

**Dominion of Canada**

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Heys, Thos. & Son.
Canadian Laboratories, Ltd.

**Quebec**

Hersey, Milton Co., Ltd
Dr. J. T. Donald

**Foreign-New York**

Ledoux & Co.

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Consulting Mining Engineer,
General Manager Crows Nest Pass Coal Co.
1909—1911
1109 Hornby St. VANCOUVER, B. C

**ASTLEY, J. W.**
Consulting Mining Engineer,
24 King Street West,
TORONTO, CANADA.
Phone M, 5199, Code: Bedford McNeill

**CARTER & SMITH**
Consulting Mining Engineers
448-449 Confederation Life B'ldg
TORONTO
W. E. H. Carter B.A. Sc. Alex. H. Smith, M.I.M.M.

**COHEN, SAMUEL W., E. M.**
Consulting Engineer,
Room 601, Dom. Express Bldg. Montreal
General Manager,
Crown Reserve Mining Co. Ltd.
Cobalt, Can.

**Colvocoresses, George M.,**
*Mining Engineer*
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New York City

**DEPENCIER, H. P.**
Consulting Mining Engineer
Room 613, Dominion Express Bldg.,
MONTREAL.
Phone Main 4984 P. O. Box 763

**EVANS, J. W.**
Mining Engineer,
Mines and Mining Properties examined and reported upon.
Belleville, Ontario.

**FORBES, D. L. H.**
Mining & Metallurgical Engineer
306 Manning Chambers, Toronto, Ont.
Mine Examination and Consultation.
Metallurgical Engineer for Merrill Metallurgical Co.

**FOWLER, S. S.**
Mining Engineer,
NELSON, B. C.

**FERRIER, W. F.**
Mining Engineer and Geologist
204 Lumsden Bldg., Toronto, Ont.
General Manager, Natural Resources Exploration Co., Limited.

**FORBES, H. L. M.Sc.,**
Mining Engineer
77 Sparks Street., OTTAWA, CAN
Specialty: Mica Phosphate.

**GWILLIM, J. C.**
Consulting Mining Engineer,
KINGSTON, ONT.

**GRAHAM, STANLEY N., B.Sc.**
Mining Engineer
BOX 92
COBALT, ONTARIO

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Mining Geologist and Consulting Engineer.
61 Waldorf Court, Brooklyn, N. Y.
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**HILLE, F.**
Mining Engineer.
Mines and Mineral Lands Examined and Reported On.
Port Arthur, Ontario, Canada.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

## ASSAYERS, CHEMISTS AND ORE TESTERS.

# BUYERS AND SELLERS OF METALS

# PROVINCE OF QUEBEC

## Department of Colonization, Mines, and Fisheries

***The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.***

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
**HALIFAX, N. S.**

## ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamations—**
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany
Northern Canada Supply Co.
**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.
Campbell & Deyell, Cobalt, Ont.
Ledoux & Co., 99 John St., New York.
Thos. Hayes & Son, 124 onge St., Toronto.
**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Brôs.
Consolidated Optical Co.
**Ball Mills—**
Canadian Alis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock BrotherYs.
Mussens, Limited.
Krupp, Fried. A. G., Germany
The John Inglis Co., Ltd.
**Beams—Steel—**
Canadian Allis-Chalmers, Ltd
Dominion Bridge Co.
Krupp, Fried.A. G., Germany.
Mussens, Limited.
**Belting—**
Canadian Allis-Chalmers, Ltd
Mussens, Limited.
Northern Canada Supply Co.
Jones &G lassco.
Canadian Fairbank- s Moore Co., Ltd.
Federal Engineers Co., Ltd.
**Blasting Batteries and Supplies—**
Canadian Allis-Chalmers, Ltd.
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Mussens, Limited.
Northern Canada Supply Co.
**Blowers—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried.A. G., Germany.
Mussens, Limited.
Northern Canada Supply Co.
**Boilers—**
Canadian Allis-Chalmers, Ltd.
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John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Canadian Fairbanks - Morse Co., Ltd.
Mussens, Limited.
Peacock Brothers.
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
The John Inglis Co., Ltd.
**Buckets—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
M. Beatty &Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.
Northern Canada Supply Co.
**Buildings—Steel Frame—**
Dominion Bridge Co.
Canadian Allis-Chalmers, Ltd.
**Cable — Aerial and Underground—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.
**Cableways—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.
**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.
Northern Canada Supply Co.
**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.
**Cars—**
Jeffrey Mfg. Co.
Orlenstein-Arthur Koppel Co.
Mussens, Ltd.
Northern Canada Supply Co.
Jenckes Bros.
Orienstein-Arthur Koppel Co.

**Cement Machinery—**
Canadian Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Northern Canada Supply Co.
Peacock Brothers.
**Chains—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
Northern Canada Supply Co.
**Chemists—**
Canadian Laboratories.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Ledoux & Co.
**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.
**Coal Cutters—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
**Coal Mining Explosives—**
Curtis & Hersey.
**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.
Roberts & Schaefer Co.
**Coal Punchers—**
Sulivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.
Roberts & Schaefer Co.
**Compressors—Air—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Canadian Allis-Chalmers, Ltd.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Brothers.
Northern Canada Supply Co.
The John Inglis Co., Ltd.
**Concentrators and Jigs.**
Canadian Allis-Chalmers, Ltd.
Diester Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Canadian Allis-Chalmers, Ltd.
James Ore Concentrator Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
**Concrete Mixers—**
Canadian Allis-Chalmers, Ltd.
Peacocks Brothers.
Mussens, Limited.
Northern Canada Supply Co.
**Condensers—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
The John Inglis Co., Ltd.
**Converters—**
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
**Conveyors—Belt—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Watorous Engine Works.
Canadian aFirbanks-Morse Co., Ltd.

**Cranes—**
SmartTurner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbanks-Morse Co., Ltd.
M. Beatty & Sons, Ltd.
Krupp, Fried. A. G., Germany.
**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.
**Crushers—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Jenckes Machine Co.
Peacock Brothers.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
**Cyanide Plants—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Roessler & Hass lacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.
**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.
**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.
**Dredging Machinery—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
M. Beatty & Sons.
Mussens, Limited.
**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.
**Drills, Air and Hammer—**
Canadian Allis-Chalmers, Ltd.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Northern Canada Supply Co.
**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Standard Diamond Drill Co.
**Drills—Diamond.**
American Diamond Rock Drills.
Sulivan Machinery Co.
Northern Canada Supply Co.
**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.
**Drills—Electric—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.
**Dump Cars—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Mussens, Limited.
Orenstein-Arthur Koppel Co.
**Dynamite—**
Curtis & Hersey (Canada), Limited.
Canadian Explosives.
Northern Canada Supply Co.
**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
iSemens Co. of Canada, Ltd.
**Ejectors—**
Mussens, Limited.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
**Elevators—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Krupp, Fried. A. G., Germany.
M. Beatty & Sons.
Sullivan Machinery Co.
John McDougall Caledonian Iron Works.
Northern Canada Supply Co.
Watorous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.
**Engineering Instruments—**
C. L. Berger & Sons.
Peacock Brothers.

**Engineers and Contractors—**
Fraser && Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Roberts & Schaefer Co.
**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
Waterous Engine Works Co.
The John Inglis Co., Ltd.
**Engines—Gas and Gasoline—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
M. aeBtty & Sons.
Canadian Westinghouse.
John Inglis & Co., Ltd.
Can. Fairbanks-Morse Co.
**Engine—Haulage—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
E. Leonard & Sons.
Jenckes Machine Co.
**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
The John Englis Co., Ltd.
Can. Fairbanks-Morse Co.
**Engines—Oil—**
Jenckes Machine Co.
Peacock Brothers.
Can. Fairbanks-Morse Co.
**Engines—Steam—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Smart-Turner Mahine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.
**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
**Fans—Ventilating—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.
**Feeders—Ore—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Mussens, Limited.
**Filters—**
Krupp, Fried, A. G., Germany.
**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co. Ltd.
**Forgings—**
M. Beatty & Sons.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
**Furnaces—Assay—**
Krupp, Fried, A. G., Germany.
Lymans, Limited.
Mussens, Limited.
**Fuse—**
Peacock Brothers.
Curtis & Hersey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Northen Canada Cupply Co.
**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Krupp, Fried, A. G., Germany.
Smart-Turner Machine Co.
Northern Canada Suply Co.
The John Inglis Co., Ltd.
**Generators—**
Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada., Ltd.
**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghiouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Ca. Ingersoll-Rand Co. Led.
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty && Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
eGo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser && Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
Consolidated Mining & Smelting Co.
Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Small-Turner Machine Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Canadian Allis-Chalmers, Ltd.
Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rrand Co.

**Pumps—Rotary—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.

**Pumps—Sinking—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Can. Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A.G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.

**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers. Ltd

**Roofing—**
Patterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
ePacock Brothers.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Hays & Sons.

**Scales—**
Can. Fairbanks-Morse Co.
Peacock Brothers.
Northern Canada Supply Co.
Thos. & Wm. Smith.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Can. Allis-Chalmers, Ltd.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.

**Shavels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Diester Concentrator Co.
James Ore Concentrator.
Can. Allis-Chalmers, Ltd.
Chalmers & Williams.
Krupp, Fried. A. G., Germany.

**Smelting Machinery—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Smelters & Refiners—**
Consolidated Mining & Smelting Co.

**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Allis-Chalmers.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Bros.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co. Ltd.
Peacock Brothers.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
John Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Can. Allis-Chalmers, Ltd.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
E. Leonard & Sons.
Peacock Bros.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Can. Allis-Chalmers Ltd
Jenckes Machine Co.

**Transformers—**
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Sons.
Peacock Brothers.

**Tube Mills—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Turbines—**
Canada Westinghouse.
Peacock Brothers.
Laurie & Lamb.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.

**Water Wheels—**
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Krupp, Fried. A. G., Germany.

**Wheels—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Jeffrey Mfg. Co.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.

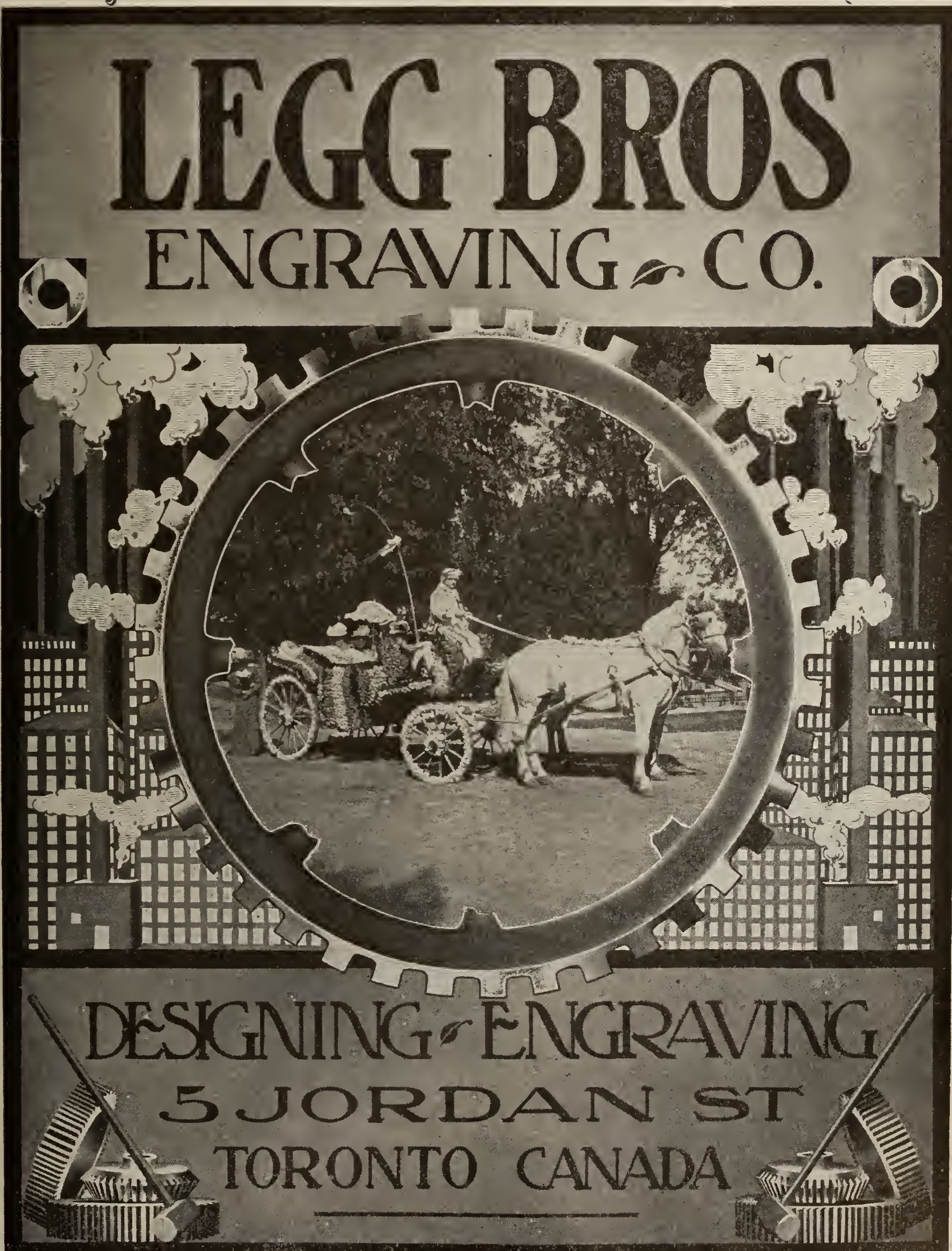
**Wire Cloth—**
Can. Allis-Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.
B. Greening Wire Co.

**Wire (Bare and Insulated)—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
Roessler & Hasslacher.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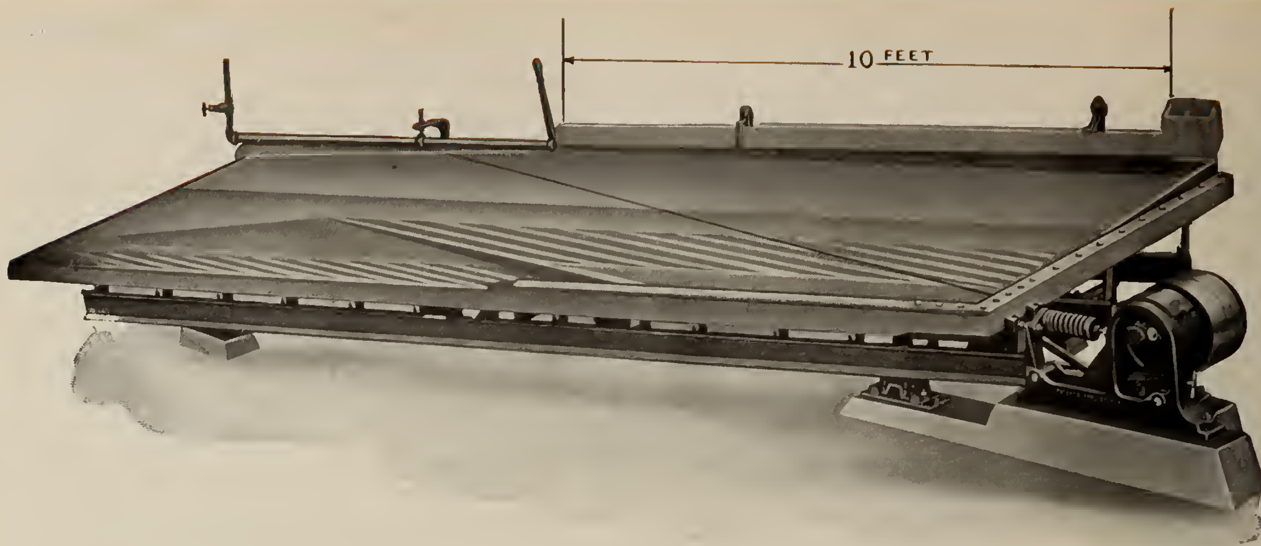


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VOL. XXXIV TORONTO No. 19



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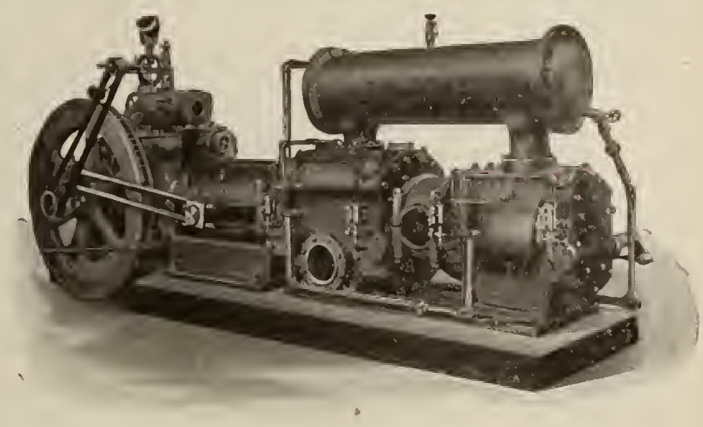

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Write our nearest office about it.

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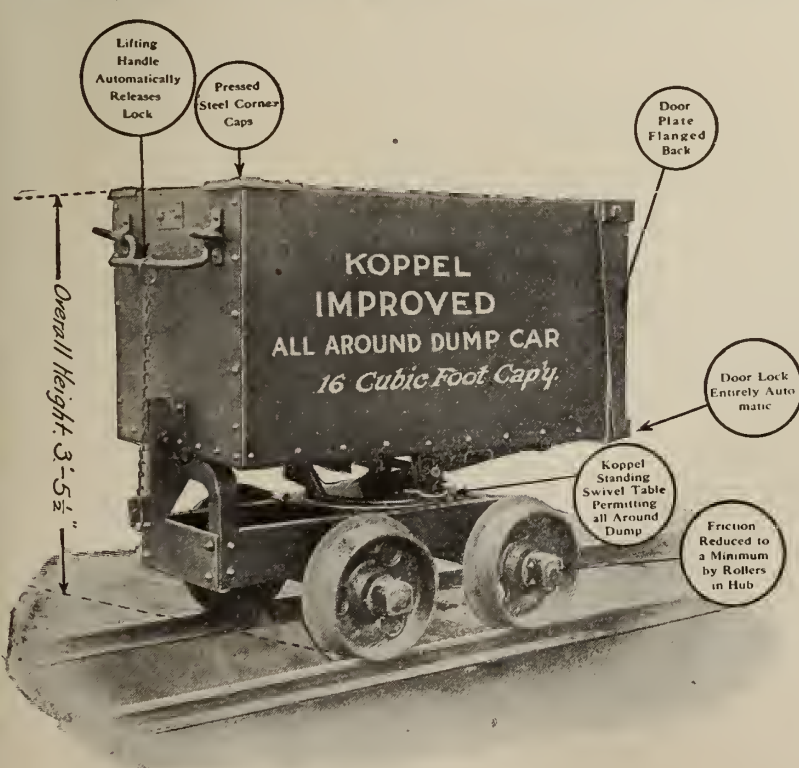


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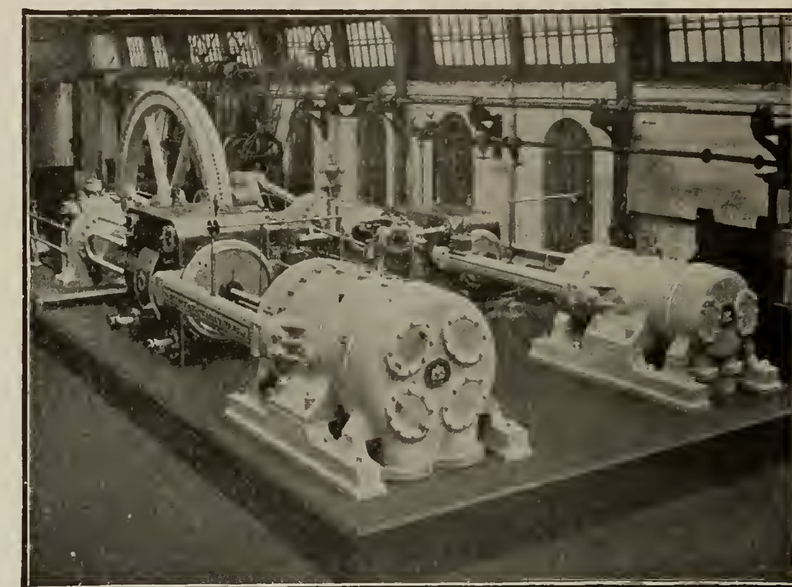

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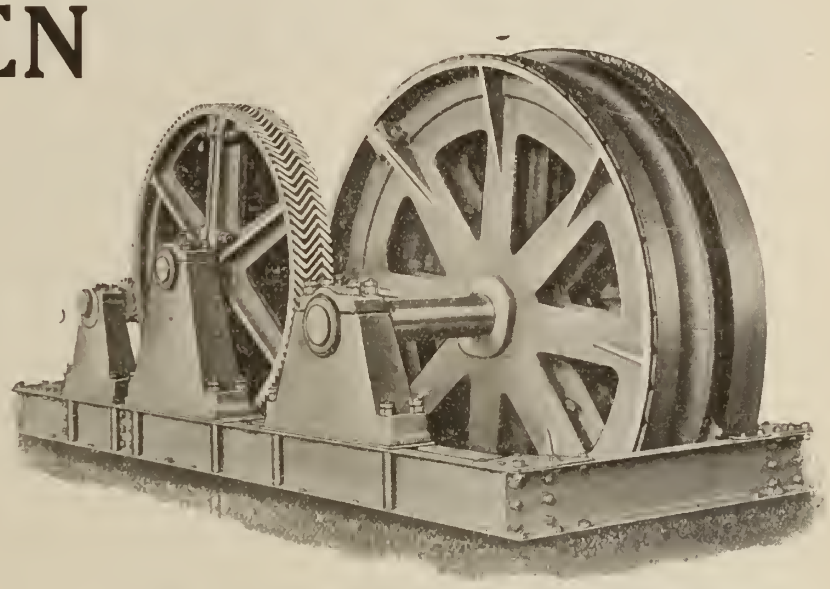

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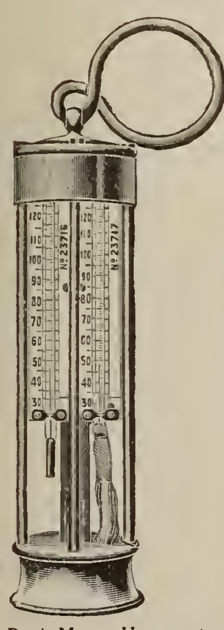

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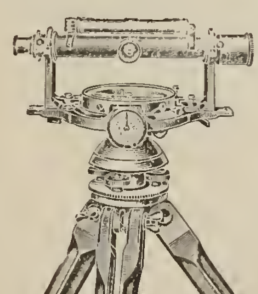

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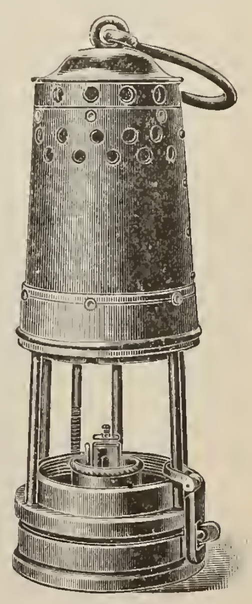

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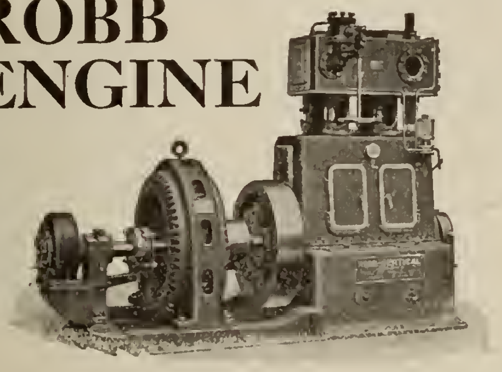

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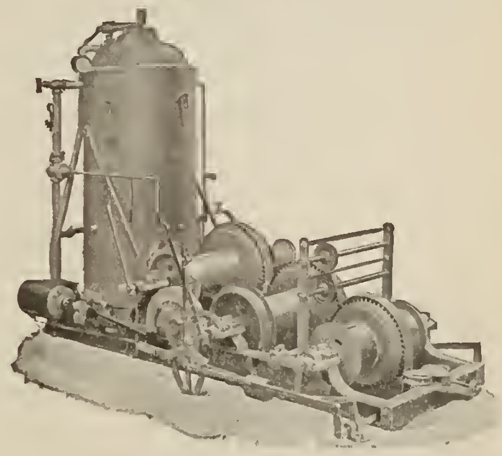

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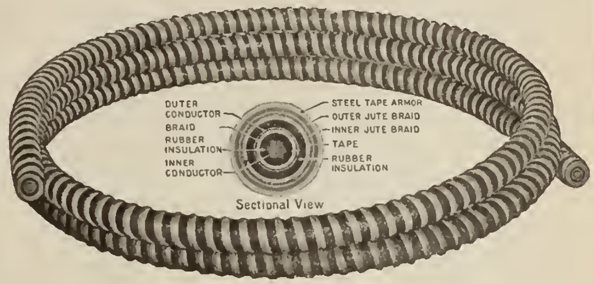


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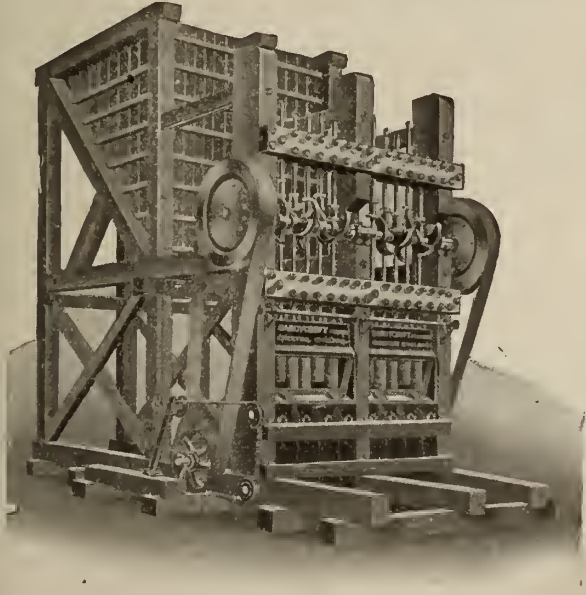

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, October 1, 1913. No. 19

## The Canadian Mining Journal

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CONTENTS.



## ECONOMIC MINERALS AND MINING INDUSTRIES OF CANADA

The Mines Branch of the Department of Mines has recently published a very useful pamphlet presenting interesting information on minerals and mining in Canada. This has been compiled under the direction of Mr. J. McLeish, Chief of the Division of Mineral Resources and Statistics, who has had the co-operation of several officers of the Mines Branch staff; more particularly Messrs. C. T. Cartwright, L. H. Cole, H. Frechette, H. S. de Schmid and A. W. G. Wilson. The publication is remarkable for its concise, clear statements. Seldom has so much information on such subjects been given in so few pages.

## QUEBEC IN 1912

Mr. Denis' report on Mining Operations in Quebec during 1912 shows an output valued at $11,187,110. In the previous year the value of the product of mines and quarries was $8,679,786. The increase is a very satisfactory one. The chief products are asbestos, cement, limestone, brick, copper and sulphur ore, lime, granite and marble.

The volume contains in addition to the resumé for 1912, a report by J. Austen Bancroft on the Geology and Natural Resources of the drainage basins of the Harricanaw and Nottaway river, to the north of the Transcontinental Railway, in northwestern Quebec.

Mr. Denis is to be congratulated on the early appearance of the volume.

## MICHIGAN COPPER MINERS' STRIKE

The strike called by the Western Federation of Miners in Michigan on July 23 has not yet been settled. Many of the mines have resumed operation. Some have a large percentage of their former employees again at work, but others are still idle and none are producing at a normal rate.

The financial loss to operators and miners continues very large. Aside from the loss to all merchants and others who depend on the mines and miners for their business, there is a large expense to the counties and to the state in providing soldiers and deputies to enforce the laws.

The strikers are being reduced to pitiable circumstances. Many already are dependent for their daily bread on the funds supplied by the union. A few dollars a week is given to those who prove to the satisfaction of the union officers that they are in urgent need. Others get nothing. Appeals are being made in several mining districts for contributions to the union treasury.

It is a notable feature of the strike that the men who quit work have, according to the mine managers, never made any request for change in working conditions or wages. It is generally reported that the men want an eight-hour day and a minimum wage; but they have not yet asked for it.

The reason for the remarkable condition of affairs is that the men are on strike at the order of officers of the Western Federation. These officers asked that the mine managers recognize them as representatives of the miners. The mine managers refused to do so, giving as reasons the past record of the Federation and the fact that the officers of the Federation do not properly represent the miners; but only such miners as they have induced to join the union. The officers claim that a large percentage of the employees are members of the union. The operators claim that a large majority are not members, and have no desire to be considered such or to be represented by the union officers.

Believing this to be the case, the managers have reopened the mines and taken back such employees as wish to work. There has as yet been no attempt to bring in large numbers of new men, though a few are now at work.

As is usual, the men going to work have been subjected to much abuse from the strikers. For weeks attempts were made every morning to prevent the miners from going to work. Encounters were frequent and serious riots were prevented only by the activity of the soldiers and deputies. On September 20 the companies applied for and were granted an injunction intended to stop such practices.

In order to settle the strike, investigations are being carried on by both State and Federal Governments. Numerous plans have been proposed; but none yet found acceptable. The union men state that what they want is recognition as representatives of the employees. The mine managers say that they will never recognize them as such. Hence they say that proposals of arbitration are not to be considered, for there is nothing to arbitrate.

In order to break the deadlock, if possible, the Copper Country Commercial Club, an organization of business men of the district, has appointed a committee of three members to offer its services to both employer and employee with a view toward the resumption of work at all of the mines.

At present it seems unlikely that there will be any settlement of the dispute between the Western Federation and the mine managers. It is possible, however, that the strikers and their former employers may come to terms if they can be brought together.

## CANADIAN NICKEL CORPORATION'S SMELTER

It is understood that the nickel company organized by Dr. F. S. Pearson and associates has taken over the property of the Dominion Nickel Company in the Sudbury district. For some time the work at these properties was carried on vigorously by the former owners; but lately there has been less activity. A smelting plant has been designed, but it is not yet erected. The financial stringency is supposedly the reason for the postponement.

In Mr. Gray's article, part of which appears in this issue, he quotes from a memorandum prepared by the promoters, in which the smelting plant is spoken of as though already in existence. There w[illegible]o signs of it two weeks ago, and we doubt whether [illegible] been erected since that time.

## CONDITIONS IN BRITISH COLUMBIA

As the third quarter of the year draws to a close, the condition of the metal mining industry of the province continues generally satisfactory. While few, if any, new mines have this year added substantially to the total of ore production, there has not been a decrease in output of the mining districts from which the chief supplies of ore are obtained. In a general way this is true of all parts of the province that have in recent years contributed to the total quantity of ore produced. Several individual instances of a reduction of output are known, but these do not include mines that have made a large production; on the other hand, there are other cases where there has already been an increase or where ore will shortly be mined to an amount that will more than offset decreases. With lode mining generally productive, and placer mining giving promise of larger results than were obtained during any of the last three or four years, there appears to exist good reason for satisfaction. Indeed, it is hoped that metal mining will show a sufficiently large increase to, in considerable measure, compensate for the loss in total production that labour troubles at coal mines have caused.

## ASBESTOS MINING IN QUEBEC

The world's chief source of asbestos is the district known as the Eastern Townships in the Province of Quebec. This district shipped in 1912 111,175 tons of asbestos, valued at $3,059,084, an average of $27.52 per ton. There was mined during the year 1,870,608 tons of rock. Wages amounting to $1,377,444 were paid to the 2,910 men employed.

During 1912 the shipments exceeded the production of the mills, and the stock on hand was reduced from 33,751 to 24,176 tons. During the present year business has been very good, and the industry is generally reported to be in better condition than it has been for some time. A few years ago the industry received a setback as the result of overcapitalization and questionable dealings in stock. The mines and mills were pushed and a large production made at a time when the market would not absorb the mineral. Soon the buyers become aware that stocks were accumulating. The price fell, and many of the mines and mills were forced to close. Conditions have now happily changed for the better. Elsewhere in this issue will be found the report of Theo. Denis, Superintendent of mines of Quebec, on Asbestos in 1912.

# ORE DEPOSITS OF THE KIRKLAND LAKE DISTRICT

By Charles Spearman.

That part of Teck and Lebel Townships, in the neighbourhood of Kirkland and Gull Lakes, is usually spoken of as the Kirkland Lake district. The centre of the district is about five miles east of Swastika Station, which is at mileage 164 on the Timiskaming and Northern Ontario Railway.

The history of the district has been more or less fully covered by papers published at various times, and therefore no space need now be devoted to it.*

The rocks of the district are for the most part sedimentaries, which have been correlated with the Timiskaming series of the Algonkian. Intrusive into the sedimentaries are lamprophyres and porphyries. Outside of the immediate neighbourhood of the district are some patches of Keewatin, upon which the above sedimentaries lie unconformably.

The relative ages of the above rocks are clearly shown at different exposures in the district, for instance, on the McKane claim, near Kirkland Lake, lamprophyre dikes cut the sedimentary series, which are in turn cut by porphyry dikes.

The conglomerate is in places rather coarse, the boulders being from two feet to three feet in diameter, but on the whole it cannot be called coarse, for the average pebble is not much larger than egg size. Practically all of the conglomerate shows evidence of great strain, for most of the pebbles are highly fractured. Thin sections also show this fragmental nature, together with abundant decomposition products, such as kaolin, chlorite, serpentine, epidote and sericite. The greywacke also shows much of the same secondary minerals of decomposition as the conglomerate, under the microscope. There is every evidence of a great thickness of the sedimentaries.

The lamprophyre is very near the camptonite porphyrite variety, the predominating feldspar being plagioclase and the phenocrysts being augite and hornblende. Some of these lamprophyre exposures are very large, covering several acres. From observation in the field, so far, there is no evidence that the lamprophyre played any important part in the introduction of the ore.

The porphyry, of which there are many different varieties, is probably the most widespread igneous rock of the district. The common variety is a reddish alkali porphyry, with predominating orthoclase phenocrysts. Some of these phenocrysts are over half an inch long, and display wonderful zonal structure, while still other gradations show a fine grained hypidiomorphic structure.

* For description of some of the deposits see July 15 issue of this journal.

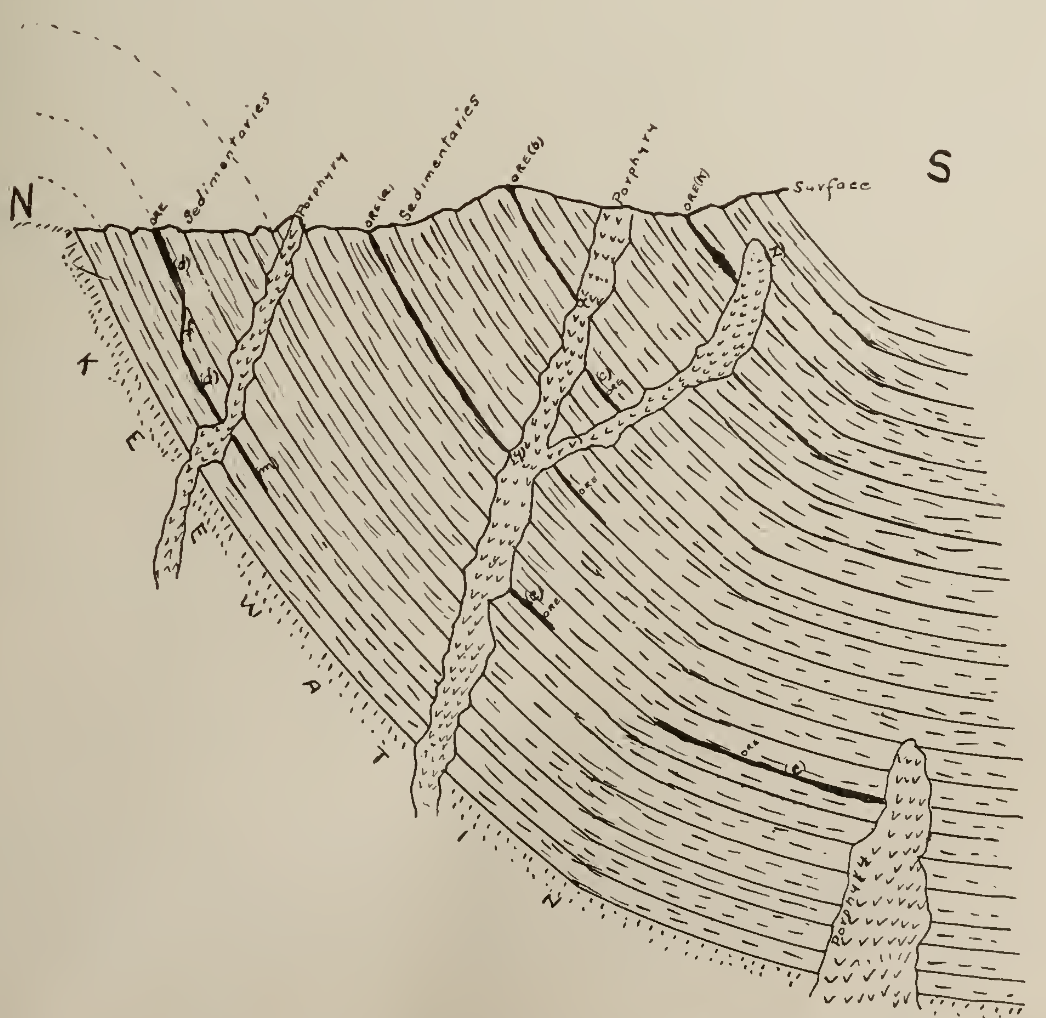



**Fig. No. 1.—Showing the relation between the porphyry and the ore bodies in the sedimentaries.**

Another variety shows the acid plagioclase albite as the predominating phenocryst, while still other varieties of the more basic type show amphibole and pyroxene phenocrysts. All the porphyries are much altered, the thin sections showing the common decomposition products.

From field observations and from exploration work already done in the district it is safe to conclude that the acid porphyries were instrumental in introducing the ore in the present deposits. The line of reasoning is as follows:

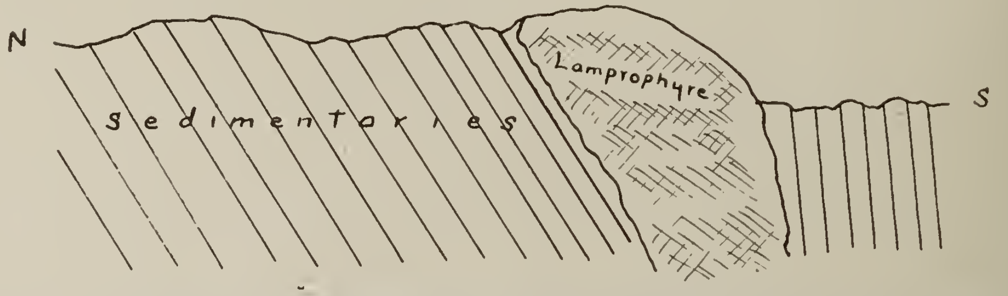



**Fig. No. 2.—Showing vertical position of strata on north part of Burnside property, due to a large lamprophyre intrusion.**

After the sedimentaries were laid down and prior to the advent of the intrusives, there appears to have been great crustal movement, which folded the sedimentaries, such that the axis of the fold was about N. 75° E., and the dip about east 75° S. This fold may have been synclinal or monoclinal, judging from what evidence is left in the field. (For the present it will be called monoclinal, as the writer has not found any evidence of northerly dips in the strata to correspond to the opposite leg of the synclinal trough.) During this process of folding many lines of weakness were created in the sedimentaries, such as fracturing across the bedding planes and faulting along the bedding planes, as shown by the slickensides. This faulting or gliding of one stratum over the other in the process of folding probably afforded the "main channels" for the mineralization solutions.

After these lines of weakness in the crust had been formed by some tectonic movement, the intrusives began to find their way to the surface through these fractures. For reasons outlined above, the porphyry only will be considered in this discussion. This porphyry crossing the bedding planes of the sedimentaries imported minerals to the lines of weakness on either side, viz., the gliding planes between the strata referred to above as "main channels." See Fig. 1.

The mineralized solutions from the porphyry following along these channels deposited minerals in every available void within the zone of its permeability. This mineralization may be seen in the "mashed" conglomerate pebbles and stringers along the channel. This method of mineralization, along such a uniformly crushed zone, accounts for the uniform value of the ore as well as its high content.

In general, under such conditions of mineralization as above, many peculiarities may arise. Glacial erosion removed the higher part of the fold, exposing some of the ore deposits as at (a) and (b), striking N. 45° E., still others may exist as at (c), yet not exposed. Conditions might also exist as at (d), where the deposit follows the bedding plane and follows a fracture as at (f), across the bedding plane. Conditions being equal, consider the deposits (a) and (b), at (b) the ore shoot is much shorter than at (a), for at (b) the length is bx, and at (a) the length is ay. The length of the ore shoot would be proportional to the distance north from the porphyry outcrop. Then again other ore bodies, such as (k), may emanate from an intrusive as (z), which is not exposed; ore as at (m) might also be found.

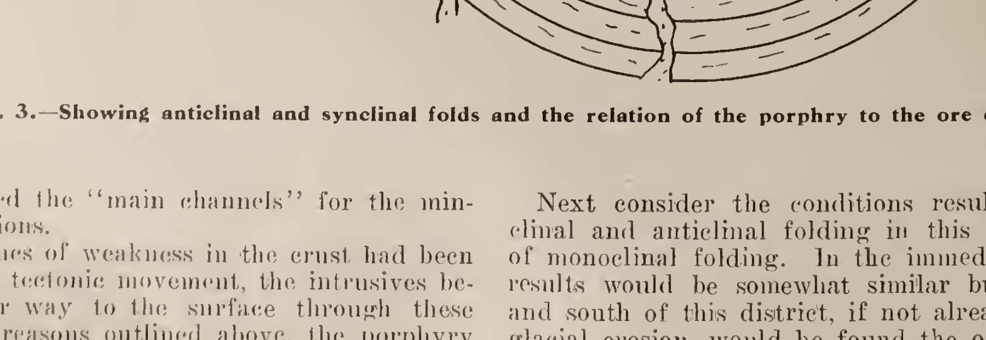



**Fig. No. 3.—Showing anticlinal and synclinal folds and the relation of the porphry to the ore deposits.**

Next consider the conditions resulting from synclinal and anticlinal folding in this district, instead of monoclinal folding. In the immediate district the results would be somewhat similar but to the north and south of this district, if not already removed by glacial erosion, would be found the other legs of the folds, and possibly the outcropping ore bodies of the bedding planes of the sedimentaries, providing there exists the porphyry intrusives to introduce the ore.

See Fig. 3. Conditions beneath the eroded surface resembling saddle reefs (a) might also occur.

In prospecting the area it is a good rule to first locate the alkali porphyry, then run the trenches north from it. This is evident from the ideal section, Fig. 1.

This type of deposit is very irregular as to width, from the fact that the width is governed by the different degrees of permeability of the sedimentaries through whose slickensided bedding plane channels the mineralized solutions flowed.

In places the strata do not preserve their regular average dip, but stand quite steeply. This may be regarded as strictly local and effecting but a small area. An example of almost vertical strata is seen in the Burnside shafts, but this may be accounted for as follows: About 200 feet north of the shaft is a great lamprophyre intrusion, which by squeezing in between the strata, turned up in almost vertical position all strata to the south of it. See Fig. 2.

The ore deposits, i.e., the economic deposits of the camp to date are not true veins, but impregnations of the sedimentaries introduced by mineralized solutions along the slickensided bedding planes. This is quite evident from the nature of the ore on either side of the slickensided surface, which preserves its lithological character throughout, many places showing the conglomerate pebbles in the very midst of the ore. This impregnation extends back into the formation for several feet on either side of the "main channels," and at times much further by following small fractures across the bedding plane. The mineralization consists of quartz, molybdenite, graphite, pyrite, gold and tellurides of lead, silver and gold. The quartz for the most part fills small fractures along the channels, and is dark coloured, having many wavy bonds of dark metallic-looking mineral running through it. As a rule a small percentage of the gold content is found in the quartz. For the most part the gold and tellurides are associated with the "impregnated" portion of the country near the slickensides. The gold content here is very high, ranging about 50 ounces per ton. The molybdenite and a small quantity of graphite give the ore a bluish black lustre, and this in conjunction with the millions of minute pyrite crystals give the ore a very rich appearance. Much free gold is disseminated throughout this mass, as well as are the tellurides. The common telluride is altaite, and to a much less degree the silver and silver-gold tellurides. There is every evidence that after the deposition of the ore the whole was subjected to slight movements at various times, which shattered the deposit. These cracks, which are very numerous and some large, but as a rule nearly microscopic are filled with secondary quartz and sometimes with calcite. At times this calcite filling encloses the pieces of native gold, which happened to be located on the fracture plane.

### Deposits Within the Porphyry.

Another class of deposit is the deposit within the porphyry itself. Of this class there are two types so far seen in the field. Firstly a fissure caused by movement of the solidified porphyry and filled with quartz and brecciated porphyry. This type seldom exceeds 8 inches, and is usually two or three inches wide. The other type suggests the flow structure, while the porphyry magma was in semi-plastic state, where the strain of the flow is almost sufficiently severe to shear, thus leaving a weakened drawn out zone, which was subsequently filled with quartz emanating from the porphyry itself, thus mineralizing the weak zone. This type is often over 18 inches wide, with much quartz filling throughout, alternated by long drawn out bands of porphyry. Again, where certain flow strains within the porphyry have not been so severe as to suggest flow structure, but nevertheless to cause lines of weakness, quartz again derived from the flow is deposited with mineralization in the strained zone. These deposits resemble very much differentiations from the porphyry, as they have no definite delineation, grading apparently insensibly into the porphyry. Deposits of this kind are usually narrow and short. Both types often carry spectacular gold.

The outcropping ore deposit in the sedimentaries is usually covered by more or less of a gossan, due to oxidation of the sulphides in the impregnated outcrop, and this often helps to locate the ore body, especially in trenching operations. The outcrop in the trench may be but a fraction of an inch in width, yet the rusty gossan will serve to locate it. Work may then be continued on the deposit along the strike or dip.

From Fig. 1, which is of course an ideal section, the conditions are such that it is not at all improbable that the mineralization extends also into the underlying Archean in the neighbourhood of the porphyry intrusives.

As development work progresses in the district, no doubt many new conditions will arise which will throw more light on the nature of the different deposits. This article is based practically on surface observations and is merely a summary of such observations.

## ASIATICS IN VANCOUVER ISLAND COAL MINES.

Our British Columbia correspondent writes: Reference has frequently been made, especially by those advocating the cause of the coal miners who stopped work and declared a strike at coal mines on Vancouver Island, British Columbia, to the number of Asiatics employed at those mines, and there have been attempts made to give the impression that very many of the non-union miners who have worked at the mines of the Canadian Collieries (Dunsmuir), Limited, are Asiatics. If reference be made to the "Annual Report of the Minister of Mines for British Columbia," 1912, p. K. 246, there will be found a table showing the "number of hands employed" at the Coast collieries for the year, namely, 4,720, of which 4,090 were employed at Vancouver Island coal mines, including: Japanese—miners 55, labourers, 62, total 117; Chinese—miners 85, labourers 537, total 622; total Orientals or Asiatics, 739, as compared with 3,351 whites, the latter including all white employees of the coal mining companies. It should be noted that 416 of the Orientals were employed above ground and but 323 underground, and of the latter number 183 were labourers. Prior to the strike, white (union) miners employed Oriental labourers underground. Five years ago—in 1908—there were employed at Vancouver Island collieries 864 Orientals out of a total of 3,460 hands; ten years ago—in 1903—there were 865 Orientals out of a total of 2,993 employed; twenty years ago —in 1893—there were 442 hands employed at the Comox (now Cumberland) coal mines, and of them 150 were Orientals. It will be seen, then, that the employment of Orientals at Vancouver Island coal mines is by no means a new departure. It is true that there are now both Chinese and Japanese certificated miners (there were shown to be 140 in 1912), but there is no law in British Columbia, nor has there been, debarring Orientals from mining coal underground after they have passed the examination prescribed by law. No official figures are available for the current year, but I have unequivocal assurance that the number of Oriental miners—that is those who do work that only certificated men may do—is this year not much, if any, larger proportionately than in 1912.

# A VISIT TO MINES OF ALBERTA AND BRITISH COLUMBIA

By Reginald E. Hore.

The C2 transcontinental excursion of the Twelfth International Geological Congress left Toronto by special train on Thursday, August 14th, a few hours after the conclusion of the session in Toronto. Hon. Louis Coderre, Secretary of State and Minister of Mines, accompanied the party, which was in charge of R. W. Brock, director of the Geological Survey, and J. McEvoy, mining engineer and geologist. H. E. T. Haultain, professor of mining at Toronto University, was secretary, and H. Frechette of the Department of Mines, Ottawa, assistant secretary. At several points along the route geologists and mining men joined the party and guided the members in the areas which they have studied.

The excursion afforded an excellent opportunity to visit western mines, especially the coal mines of Alberta and the coal, gold and copper mines of British Columbia. The large smelting plants at Grand Forks, Greenwood and Trail were also visited. On the return trip the gold mines at Porcupine and the silver mines at Cobalt gave the visitors some idea of the possibilities of Northern Ontario.

**The Landslide at Frank, Alberta.**

The excellent arrangement of the excursion gave a remarkable opportunity for study of the western mountains. The Rockies were crossed at all three passes, in going west on the Canadian Pacific Crow's Nest Pass branch, east on the Canadian Pacific main line through Kicking Horse Pass and west and east again on the recently constructed Grand Trunk Pacific line through the Yellowhead Pass. The several trips to the mines in the mountains and the steamer trips on the long lakes gave several sections across and along the ranges. In all the places visited the geologists received warm receptions from the citizens. The large cities and the small camps in the mountains in every instance extended hearty welcome to the visitors. The members have learned much of the geological structure and the mineral resources of the districts visited, and on these counts alone feel well repaid for the time and expense which the excursion demanded, but all, I am sure, will value highly also the general information gained en route. The vast extent of the grain-producing prairies, the evidence of remarkable growth of the centres of population, the splendid transportation facilities and the activity in improving and extending them, the magnificence of the mountains with their glaciers and beautiful lakes, the great rivers and their power-producing possibilities, the forests, the salmon-producing streams, the fruit ranches in the mountain valleys, have made lasting impressions. Not the least highly treasured memento of the trip is the remembrance of the kindly hospitality of the western people.

### At Winnipeg, Stony Mountain and the Stampede.

The first scheduled stop was at the capital city of Manitoba. Arriving here at noon, the party was received by a number of municipal officials and taken out on electric cars to the City Park, on the Assiniboine River. Luncheon was served in the pavilion and an address of welcome was given by Mayor Deacon. Several members of the party replied on behalf of the countries which they represent. After the luncheon a trip was made to Stony Mountain to examine the exposure of fossiliferous rocks there. Many of the party went out to the Exhibition Grounds to see the "Stampede," the great exhibition of cowboy sports, which had been running all week and which the excursionists fortunately visited on the closing afternoon, when the finals for the championships were being run off. The remarkable ability of the cowboys and cowgirls held the attention of the spectators for several hours and proved especially interesting to those unfamiliar with the romantic features of life on the plains. The roping of steers, riding wild horses and the exhibitions of fancy roping proved more attractive than the possibility of finding fossils in Stony Mountain. It is reported, however, that some of the party, not realizing the attractive nature of the "Stampede," did actually spend the afternoon in a very industrious attack on the fossiliferous limestones.

### Medicine Hat Gas Field.

From Winnipeg the party travelled westward through the great grain fields to Medicine Hat, Alberta. Here a stop was made to visit the gas wells and the manufacturing plants which have recently grown up as the result of the use of cheap fuel furnished by the city. Near Medicine Hat there are two important producing wells, from which gas is piped 178 miles to Calgary. The city has within its limits a large area of gas-producing horizons and has drilled several wells. To manufacturing industries gas is supplied free for five years and after that period is supplied at a low figure—about five cents per thousand.

### The Great Landslide at Frank, Alberta.

From Medicine Hat the Crow's Nest Pass route was followed. At Hillcrest the party left the train to view the results of the disastrous landslide which occurred at Frank in 1903, and which is believed to be one of the greatest which has ever occurred. As a result of the openings made in the process of mining coal the whole side of Turtle Mountain broke away on extensive joint planes and piled up a mass of rock at a great distance away and high up the opposite side of the valley. It seems almost a physical impossibility that the sliding of rock down the mountain side would of itself produce enough energy to send the material so far and so high. It is nevertheless believed by Mr. Brock and others who made special study of the phenomenon soon after its occurrence that such was the case. Mr. Brock, in pointing out features of the extraordinary slide stated that eye witnesses saw the great mass rebound as it struck the bottom of the valley and actually leap up the opposite slope. This account is borne out by the fact that there is actually a decided valley in the debris, such as might have been thus formed. It has been utilized in rebuilding the railroad across the area covered by fallen rock, and is a marked depression which greatly facilitated construction.

The actual position of the fallen rock suggests what might have been expected if a gigantic blast had been fired along the joint plane. Sudden relief of horizontal tension may have been partly responsible for the extraordinary distribution of the broken rock.

There are numerous large open joints parallel to the face along which the slide took place and another large portion of the mountain is believed by Mr. Brock to be in a very precarious condition and liable to slide. A danger zone has been established and warning given to the public by a commission appointed by the Government to examine and report on the condition of the mountain. The most dangerous period of the year is when freezing and melting of water is occurring in the joint planes. The action of frost is liable to set off the trigger, as Mr. Brock puts it.

### Coal Mines at Hillcrest, Frank and Blairmore.

After examining the Frank landslide several coal mines and structural sections were visited. At Blairmore the party were taken into the International Mine, where a very extensive bed of coal is being mined. The tunnel level runs for nearly three miles into the mountain, and from it rooms have been driven several hundred feet to the surface.

### The Corbin Coal Seams.

To visit the Corbin mine the excursion train was taken sixteen miles south from McGillivray on the Eastern British Columbia Railway, which follows the south fork of Michel creek. At Corbin the mining company had made excellent arrangements for taking the visitors up to the great exposures of coal over 1,000 feet above the town and 6,100 feet above sea level. A standard guage railway has been recently constructed up the hill and, for the convenience of the geologists, a gondola was fitted up as an observation car and pushed ahead of the locomotive up the grade. General Manager Roberts and Superintendent Graham accompanied the party.

**Air locomotive and train load of geologists ready to enter International coal mine at Blairmore.**

Part of the ascent is made directly and is intended to be later used as a section of the railroad which will be continued south up the valley. The upper part is made by a series of switchbacks.

The outcrop of coal is a very remarkable one. The seam is usually thick and forms the surface rock for a large area on the slope of the hill. Bore holes driven to determine the thickness show that there is a large area which carries from 50 to 100 feet in thickness. Below this there is a slate bed 10 to 20 feet in thickness, and then a second bed of coal about as thick as the slate. At the mine the coal seam dips at a gentle angle to the west. Further down the slope the beds flatten and then turn up, the shale coming to surface. Higher up the hill there are outcrops of the beds which underlie the coal seam and then another thick bed of coal. The structure

Geologists on way to Corbin coal mine, B.C.

of the rocks indicates that the two outcrops of coal are in reality parts of the same bed. A bed of sandstone stratigraphically below the coal shows distinct anticlinal structure, is succeeded by coal, slate and coal beds which are quite similar to those lower down the hill.

While the party was at the mine the manager showed them an operation unique in coal mining. A steam shovel working in the thick seam loaded a standard freight car in a few minutes. It would be possible to make an enormous output in this way at a low cost, but without selection the product is not of good grade, and it is not thought that the steam shovel will be in regular operation, though it may be used on occasion. In any case it will be possible to mine a large quantity very cheaply.

After viewing the thick seams, the party was led by Mr. Clapp, guide for the day, to the older workings and then down the hill to Corbin. The old workings are on much thinner seams. The thick seam has only recently been explored and is not yet making a large production.

### Coal Creek.

From Corbin the C2 special was taken down Michel creek to the Crow's Nest line, and then on to Fernie. From Fernie a special local train took the visitors to the mines and plant at Coal creek. There are several seams lying rather flat and cut by the valley. The tipple is located in the valley and ore is drawn from either side. The main seam at this mine is said to be about 30 feet thick and one of the best in the district. The other seams are considerably smaller, but some are very good coal. Besides the seams being worked there are others which are very high in hydrocarbons and which, when heated, melt and run on the grate. General Manager Wilson pointed out some of the peculiar features of the coal seams of the district. Notable ones are unusual crumpling or rolling of the seams making it difficult to

Mining coal with steam shovel. Corbin mine, B.C.

keep the openings straight and the great quantity of gas encountered in crushed portions of the beds.

After visiting the plant and watching the methods of handling the coal, the party returned to Fernie. In the evening a smoker was given by the city. The Mayor welcomed the members of the Congress and called upon Mr. Brock to preside and ask the visitors to do the talking. Mr. Schofield gave a very instructive talk on the structure of the Cordilleras. This was much appreciated, as the following day included a section across the ranges. The members then entertained one another by several impromptu speeches, songs and dances contributed by men of various nationalities. Local singers also contributed, and after luncheon had been served the party became a very merry one. Mr. Ashworth of Manchester and Piper Ferguson and the Scotch dancers, and the German chorus contributed largely to the success of the smoker.

### Reception at Frank.

After visiting the coal mines at Blairmore and Coleman, the train was run back to Frank, where the members were entertained at a supper in the Sanitorium Hotel. The members were welcomed by the citizens, and several replied in kindred spirit and thanked the people for their hospitality. Among those who spoke on behalf of the visitors were Hon. Louis Coderre, Minister of Mines; Mr. Bedford McNeill, president of the Institution of Mining and Metallurgy; Mr. Dahlblom, Inspector of Mines, Sweden; Mr. Boggild of Denmark, Mr. Kukuk of Germany and Director R. W. Brock of the Geological Survey of Canada.

(To be Continued.)

# CROWSNEST PASS COAL FIELDS*

By W. W. Leach.

The territory lying between Burmis, Alberta and Elko, British Columbia, includes all the coal fields, containing high-grade bituminous coal of Kootenay age in the Crowsnest Pass, which are traversed by the Crowsnest branch of the Canadian Pacific Railway.

These fields may be broadly divided into two groups, the most easterly lying in the Province of Alberta and separated from the westerly or British Columbia group by the main range of the Rocky Mountains. Each of these groups consists of a number of separate areas of coal-bearing beds.

On the Alberta side of the mountains the various coal areas are divided by a series of great faults, following closely the strike of the strata, while the individual areas have been subjected to severe folding and some minor faulting. On the other hand, the British Columbia group is composed of a number of more or less regular basins, the most important of which has a length of some 35 miles with a maximum width of 11 miles.

The coal is contained in rocks of Kootenay age (Lower Cretaceous) consisting of hard, grey sandstones, grey black, and carbonaceous shales with, towards the top, some hard siliceous conglomerate holding many chert pebbles. In the Alberta group the Kootenay rocks have a total thickness of not more than 700 feet containing from 5 to 6 seams of coal with an aggregate thickness of about 50 feet, while a section measured near Morrissey, on the British Columbia side of the Pass, showed 3,200 feet of Kootenay rocks with 216 feet of coal contained in seams of over 1 foot in thickness. Similarly the Fernie shales, of Jurassic age, underlying the Kootenay are very much thinner in Alberta than in British Columbia, in the former having a thickness of about 650 feet, while near Fernie, B.C., they attain a thickness of over 3,000 feet.

The coals throughout this district are all of a very similar nature, with the exception of a number of small seams found near Fernie, overlying the main coal measures, which contain coal of a semi-cannel character.

Nearly everywhere the coal cokes readily and is utilized to a large extent in the manufacture of that product; it is generally rather friable, and often contains a somewhat large amount of ash, but it has been found to be eminently adapted for steam raising purposes and is in much demand by the railways for locomotive use. The following proximate analyses, from air-dried samples, give a general idea of the quality of the coal:—

| Locality. | Moisture. | Vol. Comb. | Fixed Carbon. | Ash. | Remarks. |
|---|---|---|---|---|---|
| (1) Bellevue—No. 1 seam.............. | 0.2 | 27.5 | 56.8 | 15.5 | Run of mine coal. |
| (2) Coleman—No. 4 seam ............. | 0.6 | 23.8 | 59.5 | 16.1 | do. do. |
| (3) Michel—No. 8 seam ............... | 1.1 | 23.8 | 65.0 | 10.1 | Coal, screened and picked at mine. |
| (4) Hosmer—No. 8 seam ............... | 1.3 | 27.6 | 63.7 | 7.4 | Coal hand-picked at testing palnt. |
| (5) Coal Creek—No. 2 seam ........... | 1.3 | 26.0 | 63.8 | 8.9 | Coal screened and picked at mine. |
| (6) Marten Creek .................... | 2.10 | 57.71 | 30.33 | 9.86 | Camel coal, surface sample. |

In the year 1910, a total of 3,137,138 tons (2,000 lbs.) of coal was produced in the district, of which amount Alberta contributed 1,608,205 tons, and British Columbia 1,528,933 tons, from which 121,578 tons of coke were made in the former Province, and 241,579 in the latter. In 1911, the output was very much less, due to the fact that for eight months nearly all the mines were idle on account of a miners' strike.

**The Davenport Coal Company** has developed six coal seams, the several thicknesses of which are 3.4 feet, 5

*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.

feet, 4.6 feet, 5 feet, 6 feet, and 6 feet. The coal is mined by pillar and stall method and hauled to the tipple by endless rope; the steel tipple is equipped with Marcus screens, built at Newcastle-on-Tyne, and is capable of handling 120 tons per hour.

**Police Flat Siding.**—At Police Flat is situated one of the Leitch Collieries' plants. This point is on the axis of a sharp anticline and is underlaid by Dakota rocks, but about half a mile to the north, where the mine is situated, erosion has uncovered the underlying Kootenay beds. Here five seams of coal have been proven, 2 feet, 6 feet, 5 feet, 4 feet, and 10 feet, respectively, in thickness. The mine is worked by pillar and stall system, and on account of the steep dip (60°) the rooms are driven diagonally up the pitch. The coal is hauled in the main gangway and to the tipple by gasoline motor. The tipple is of the Phillips cross-over type and is equipped with shaking screens and picking tables, and has a capacity of 1,000 tons in two shifts. From the tipple the slack coal is elevated to the washing plant, of Luhrig jig type, with a capacity of 500 tons washed coal in ten hours. After washing, the coal passes to bins holding 1,000 tons and thence by electric lorries to the coke ovens, 101 in number; these ovens are a modified bee-hive, rectangular in shape and are mechanically levelled and pushed. They take a charge of 10 tons of coal.

**Bellevue Siding.**—At Bellevue, the West Canadian Collieries, Ltd., are operating an important mine. Four seams intersected by a cross-cut tunnel are 9 feet, 17 feet, 4¾ feet, and 15 feet, respectively, in width, in a total thickness of 450 feet of measures. Two other seams, one 4 feet, the other 3½ feet in thickness, are known to occur below these. The coal is worked by pillar and stall system, the rooms being driven directly up the pitch. In driving a crosscut from No. 1 seam to intersect the lower seams from a point some two miles from the entry, a notable double fold was met with, No. 2 seam having been cut in three places while No. 1 and 3 seams were entirely missed; the accompanying sketch will make this clear.

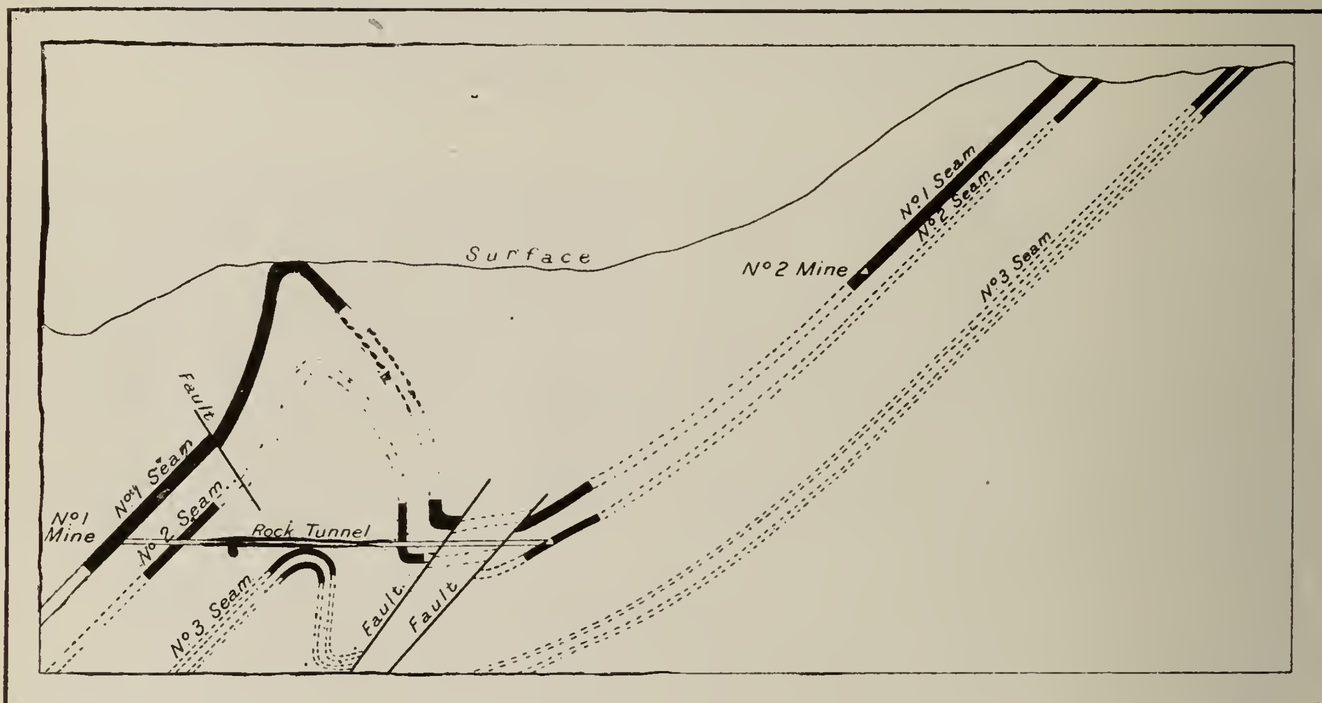
About one-half mile to the east of Bellevue, the Maple Leaf mine is situated. The folding mentioned above is well seen here, the coal seams being repeated four times in a distance of about one-half mile.

**Hillcrest.**—At this station a short spur turns off to the south to Hillcrest town and mine. The mine is located on the western limb of a broad undulating syncline, on the eastern limb of which the Bellevue mine is situated. Three seams, 14 feet, 8 feet, and 9 feet in thickness, have been developed at this point.

**The Canadian Coal Consolidated** is operating two mines at Frank; the first is opened by a drift parallel to the face of Turtle Mountain and driven in a southerly direction. Three seams have been proved but one only, the highest, is being worked; this seam is from 12 to 15 feet thick. The coal is hauled along the main level and to the tipple by means of gasoline locomotives.

No. 2 mine is situated about one-half mile north of No. 1, and is being operated by means of a shaft 330 feet in depth. The main level, driven from the bottom of the shaft, runs in a northerly direction towards Bluff Mountain. From this mine the daily output is about 450 tons.

**Lille Coal Mine.**—From Frank, the Frank and Grassy Mountain Railway branches off to the north and follows the valley of Gold Creek for about 7 miles. About 5 miles up this line the town of Lille is situated, where the West Canadian Collieries are operating their Lille mine. A coal seam 4 to 5 feet in thickness has been worked here quite extensively. The mine is




Geological Survey, Canada

*Section in **Bellevue Mine** showing folding of coal seams*

operated on the pillar and stall system with compressed air haulage on the main levels, the tipple capacity being about 1,200 tons in two shifts. The company has a coking plant at this point consisting of a washery for treating the slack coal and a battery of 50 Belgian ovens of the Bernard type.

**Blairmore.**—At this point the West Canadian Collieries are operating a mine on the south side of the railway, with an output from 700 to 1,000 tons a day. The coal seams have also been prospected for some distance north of the track.

**Coleman.**—At Coleman two companies are operating coal mines, one on each side of the valley. The plant and mines of the International Coal and Coke Company (Dennison Colliery), are situated to the south of the railway where five coal seams have been proved, of which No. 2, 15 feet, and No. 4, 6 feet are at present being worked. Both seams are opened by means of levels driven on the strike, the coal being won by pillar and stall method, and the rooms driven up the pitch, which is here about 32 degrees.

The capacity of the mine and plant is about 3,000 tons daily.

The coke plant consists of a Bradford breaker and 216 beehive ovens, the coal being delivered to the ovens by electric lorry.

The McGillivray Creek Coal and Coke Company's mine is situated on the north side of the valley, about one-half mile from the railway. One seam, from 10 to 12 feet in thickness, the No. 2 of the series, has been developed by means of a slope with levels driven from its foot, the coal being worked by pillar and stall system. From the top of the slope the mine cars are hauled by electric motor along a surface tram to the tipple, a distance of one and one-half miles. The tipple, of steel construction, is equipped with screens and picking belts, and is capable of handling about 2,000 tons in two shifts daily.

**Corbin.**—At Corbin a similar outlying remnant of the coal-measures is being exploited by the Corbin Coal and Coke Company. This company is operating two mines; No. 1 being opened near the valley level by means of a tunnel along the strike of the seam, while No. 2 mine is situated nearly 1,000 feet above the floor of the valley. The geological relationship of these two openings has not as yet been worked out, and it is possible that the same seam is represented at both places. At No. 1 mine the seam is nearly vertical and varies greatly in size, from a minimum thickness of 10 feet to a maximum of nearly 250 feet; this great difference may be due to compressed monoclinal folding. At the upper mine the coal has been stripped near the top of the hill, and shows the coal in a synclinal basin about 370 feet in width; the thickness of the coal near the centre of the syncline having been proved by drilling to be over 100 feet.

The upper mine is reached from the valley by means of a switch-back railway and the coal is worked in open cuts with a steam shovel. The output in 1910 from No. 1 mine alone amounted to about 142,000 tons.

**McGillivray.**—McGillivray station is situated near the eastern edge of the main Crowsnest coal basin, the rocks having general westerly dips. From the station to the junction of the North Fork with the main Michel Creek, where the coal measures proper are entered, the railway follows closely the strike of the Fernie shales.

The Crowsnest basin has a total length along its major axis of about 35 miles, with a maximum width of 11 miles, and is estimated to cover an area of about 230 square miles. In a sec. sey, 22 coal seams, of one fo were noted, containing in the ag coal in a total thickness of measures of feet. The greater part of the coal, however, of 198 feet, occurs in a thickness of strata feet. Assuming the extent of the basin to square miles, and the average thickness of w coal at 100 feet, the total available supply of coa would be about 23,000,000,000 tons.

The coal measures are overlain by a great series of conglomerates, sandstones and shales containing, towards the base, thin seams of coal of a semi-cannel nature and reaching a maximum thickness of from 4,000 to 5,000 feet. It is over comparatively limited areas only, however, that such great thicknesses of the overlying beds are to be found, denudation having removed them to a large extent over the greater part of the basin.

Where crossed by the railway in the valley of Michel Creek, the basin has narrowed to about four miles in width and the beds overlying the coal measures have been entirely removed by erosion.

**Michel.**—At Michel, near the centre of the trough, the Crowsnest Pass Coal Company is operating an extensive colliery and coke-making plant. The company has developed seven seams in all, four on the south side of the valley and three on the north side; of the former the seams designated upper No. 3, No. 3. No. 4 and No. 5, have the following respective widths: 10 to 12 feet, 4½ to 5½ feet, 6 to 8 feet, and 6 to 8 feet, while on the north side, No. 7 seam is about 11½ feet thick with a 2½ foot parting; No. 8 is from 8 to 14 and No. 9 is about 10 feet thick. No. 9 seam has not been worked for some years. All the mines at Michel, with the exception of No. 3, are worked by the pillar and stall method: in No. 3 the longwall system is in use. A total of 486 beehive coke ovens have been built at Michel.

**Hosmer.**—At Hosmer the colliery of the Department of Natural Resources of the Canadian Pacific Railway is situated. A rock tunnel, across the measures, has been driven at a point 600 feet above the railway for a distance of 4,931 feet, which has cut ten coal seams of the following dimensions:—

| | |
|---|---|
| No. 1 seam, | 18 feet (5.4 m.). |
| No. 2 " | 12 feet (3.6 m.). |
| No. 3 " | 22 feet (6.7 m.). |
| No. 4 " | 4 feet (1.2 m.). |
| | 5 feet coal, (1.5 m.). |
| No. 5 " | 10 inch parting, (25.4 cm.). |
| | 13 feet coal, (3.9 m.). |
| No. 6 " | 8 feet 8 ins. (2.6 m.). |
| No. 7 " | 4 feet (1.2 m.). |
| No. 8 " | 5 feet (1.5 m.). |
| No. 9 " | 8 feet (2.4 m.). |
| No. 10 " | large seam. |

Of these seams Nos. 2, 9 and 10 are at present being worked, and it is probable that Nos. 9 and 10 correspond to seams Nos. 2 and 1, respectively, of the Coal Creek Colliery. The lowest seams, first cut in the tunnel, have easterly dips of 63 degrees, the dip flattening from three on the minimum of about 25 degrees. In addition to the tunnel seams, the company is operating a mine on the outcrop of the coal, where No. 2 seam is being worked by means of a slope; this point being several hundred feet higher than the tunnel entry.

oal is lowered to the tipple ed, double-track incline, and upple by air locomotives. The onstruction, is equipped with screens lts, and has storage bins with a capa- tons of coal and 2,400 tons of slack. The treated in a Robinson washer of 400 tons acity, the washed product being utilized in e manufacture of coke in a battery of 240 beehive ovens.

**Fernie.**—Altitude 3,302 feet (1,006.4 m.). Fernie, a town of about 5,000 population, is the British Columbia headquarters of the Crowsnest Pass Coal Company; from here the Morrissey, Fernie and Michel railway branches off and follows the valley of Coal Creek up for a distance of five miles (8 km.) to the Coal Creek colliery.

**Coal Creek** is a tributary of the Elk River from the east, which occupies a comparatively deep valley cut through the Cretaceous rocks, thus affording a suitable railway grade to the point where the valley floor rises to meet the easterly dipping coal measures. Here the mines are situated. The coal seams strike approximately at right angles to the valley, thus enabling tunnels to be driven on the seams on each side of the creek, while, as this point is approaching the centre of the basin, the seams dip at much lower angles (12 to 18 degrees) than at their outcrop along Elk River escarpment. The company is working five seams here while several others have been prospected to some extent. The seams being worked with their several thicknesses, are as follows:—

| | | |
|---|---|---|
| No. 1, | Average thickness | 10 feet. |
| No. 2 | " " | 4½ feet. |
| No. 5 | " " | 12-14 feet. |
| A | " " | 8 feet. |
| B | " " | 3½ feet. |

Seams Nos. 1, 2 and 5 are the ones most extensively worked; Nos. 1 and 5 being opened on the north side of the valley, while three mines are being operated on No. 2 seam, viz.—No. 9 mine on the north side and Nos. 2 and 3 on the south side of the valley. The coal from all the seams except No. 2 is mined by the pillar and stall method, whereas, in the mines on No. 2 seam, the longwall system is in use. Inside the mines, haulage is by horses and air locomotives, while all the coal from the various mines is hauled to the same tipple from the several entries by steam or electric motors. The tipple, a steel structure 840 feet in length, which bridges the valley, is of the Heyl and Patterson revolving side dump pattern, and is capable of handling 4,000 tons daily. It is electrically driven and equipped with the necessary screening and picking appliances. The slack coal is stored in large bins at Fernie and is utilized there in making coke, 452 beehive ovens being in operation.

**Morrissey.**—At Morrissey another branch of the Morrissey, Fernie and Michel Creek Railway leads up the north side of Morrissey Creek to the Carbonado colliery of the Crowsnest Pass Coal Company. The Carbonado mines have been idle for some years, although at least nine seams have been worked at different times, and a large plant, including 240 coke ovens, installed. The extremely gaseous nature of the coal at this point, resulting in a number of serious outbursts of gas, has caused it to be considered expedient to abandon this colliery for the present.

On the south side of Morrissey Creek and extending to the south branch of Michel Creek on the eastern edge of the coal basin, the Dominion Government holds in reserve a block of 45,000 acres of coal land, being part of a total reserve of 50,000 acres, the remaining 5,000 acres being situated to the northeast of Hosmer.

## COST OF LAKE SUPERIOR STRIKE.

The Boston News Bureau of Sept. 20 says that the strike at the Lake Superior copper mines, which is now on its ninth week—but gradually breaking up—has cost the miners thus far about $2,400,000 in lost wages, while dividend reductions ordered to date have amounted to $625,000. Figuring probable reductions by Wolverine, Mohawk and Osceola at next declarations, the loss to stockholders will approximate $1,000,000.

There were between 16,000 and 18,000 miners involved in the strike, with an average daily wage of $3.50, making the daily pay roll over $50,000.

Four Lake Superior companies have declared dividends since the strike started late in July. In the following table we present a comparison of the quarterly dividend rates of these companies, prevailing before the strike, with present rates and total losses to stockholders:

| Companies | Shares. | Prev. Rate. | Pres. Rate. | Losses. |
|---|---|---|---|---|
| Calumet & Hecla .. | 100,000 | $10.00 | $6.00 | $400,000 |
| Ahmeek .......... | 50,000 | 5.00 | 3.00 | 100,000 |
| Copper Range ..... | 393,712 | .75 | .50 | 98,428 |
| Quincy ........... | 110,000 | 1.25 | 1.00 | 27,500 |
| Total.......... | .... | .... | .... | 625,928 |

## KERR LAKE.

Kerr Lake Mining Company reports for year ended August 31:

| | 1913. | 1912. | 1911. |
|---|---|---|---|
| Ore sales ........ | $1,182,493 | $1,044,417 | $1,231,246 |
| Expense .......... | 345,178 | 275,242 | 293,870 |
| Net profit ...... | 837,315 | 769,175 | 937,379 |

| | 1913. | 1912. |
|---|---|---|
| Profit and loss account Aug. 31 | 716,992 | 709,817 |
| Net profit year ended Aug. 31. | 837,315 | 769,175 |
| Total .................... | 1,554,307 | 1,478,992 |
| Dividends payable during year | 600,000 | 762,000 |
| Profit and loss Aug. 31 ....... | 954,307 | 716,992 |

Kerr Lake Mining Company, of New York, the holding company, reports for year ended Aug. 31, 1913:

| | 1913. | 1912. | 1911. |
|---|---|---|---|
| Dividends from Kerr Lake Mining Co. ....... | $600,000 | $762,000 | $1,338,000 |
| Dividends from Wettlaufer, Lorrain, etc. ...... | 652 | 679 | 6,545 |
| Total ......... | 600,652 | 762,679 | 1,344,545 |
| Exp. & taxes .... | 19,137 | 21,645 | 33,056 |
| Divs. pay ....... | 600,000 | 690,000 | 1,200,000 |
| Written off ...... | 15,000 | 45,000 | 45,000 |
| Surplus......... | *33,484 | 6,033 | 111,488 |

*Deficit.

Production amounted to 2,109,975 ounces of silver, at a cost of 21.39 cents per ounce, which compares with production of 1,855,495 ounces at a cost of 18.30 cents per ounce in the previous year. Ore reserves at the end of the year were 6,019,300 ounces, against 6,660,091 ounces at close of previous year.

Balance sheet of the operating company shows cash, short term bonds and notes, ore, etc., on hand amounting to $868,692, with taxes and accounts payable, etc., amounting to $47,600, leaving excess of quick assets $821,092.

# ASBESTOS MINING IN QUEBEC IN 1

By Theo C. Denis, Superintendent of Mines.

Asbestos in 1912 heads the list of mineral products of the province. After passing through a rather critical period the asbestos industry is now regaining its balance, and the outlook for the future is bright. The following table gives details of the asbestos in the Province of Quebec durin 1912:

**Production of Asbestos for the Year 1912.**

| Qualities. | No. of Men. Employed. | Wages Paid. | Shipments. Tons. | Shipments. Value. | Aver. value per ton. | Stock on Hand. Tons. | Stock on Hand. Value. |
|---|---|---|---|---|---|---|---|
| Crude No. 1 | .... | ........ | 1,941 | 510,785 | 263.16 | 867 | 221,215 |
| Crude No. 2 | .... | ........ | 3,766 | 379,445 | 100.76 | 2,867 | 310,596 |
| Mill stock No. 1 | .... | ........ | 3,682 | 237,203 | 64.42 | 2,370 | 137,106 |
| Mill stock No. 2 | .... | ........ | 32.689 | 1,018,960 | 31.17 | 8,234 | 301,774 |
| Mill stock No. 3 | .... | ........ | 69,097 | 912,691 | 13.21 | 6,838 | 131,515 |
| Totals | 2,910 | 1,377,444 | 111,175 | $3,059,084 | 27.52 | 24,176 | 1,102,206 |

Quantity of rock mined, 1,870,608 tons.

For the two previous years, 1911 and 1910, the figures are given in the tables below:

**Production of Asbestos for Year 1911.**

| | Shipments. Tons. | Shipments. Value. | A. value per ton. | Stock on Hand. on Dec. 31st, 1910. Tons. | Stock on Hand. on Dec. 31st, 1910. Value. |
|---|---|---|---|---|---|
| Crude No. 1 | 1,400 | $ 388,224 | $277.30 | 1,358 | $ 360,304 |
| Crude No. 2 | 3,382 | 382,980 | 113.68 | 3,368 | 431,548 |
| Mill Stock No. 1 | 6,340 | 415,559 | 65.54 | 3,794 | 207,403 |
| Mill Stock No. 2 | 35,991 | 1,091,684 | 30.33 | 12,272 | 379,523 |
| Mill Stock No. 3 | 55,111 | 747,759 | 13.57 | 12,959 | 204,298 |
| Totals | 102,224 | $3,026,306 | 29.60 | 33,751 | $1,583,076 |

Quantity or rock mined during 1911, tons, 1,759,064.

**Production of Asbestos for Year 1910.**

| | Shipments. Tons. | Shipments. Value. | A. value per ton. | Stock on Hand. on Dec. 31st, 1910. Tons. | Stock on Hand. on Dec. 31st, 1910. Value. |
|---|---|---|---|---|---|
| Crude No. 1 | 1,817 | $ 471,649 | $259.57 | 1,763 | $ 447,227 |
| Crude No. 2 | 1,612 | 196,382 | 121.82 | 3,181 | 440,884 |
| Mill Stock No. 1 | 10,313 | 627,635 | 60.88 | 4,938 | 313,053 |
| Mill Stock No. 2 | 44,793 | 1,141,374 | 25.48 | 24,417 | 612,065 |
| Mill Stock No. 3 | 22,070 | 230,789 | 10.46 | 6,920 | 99,694 |
| Totals | 80,605 | $2,667,829 | $33.10 | 41,159 | $1,921,923 |

Quantity of rock mined during year 1910, tons, 2,035,705.

The classification adopted by the Quebec Mines Branch is an arbitrary one. Each mine has its own grading, and there is no uniformity between the products of the different mines. In the tables above given the values of the various grades have been grouped as follows:

Crude No. 1—Hand-cobbed asbestos valued at $200 a ton and over.

Crude No. 2—Hand-cobbed asbestos valued at less than $200 a ton.

Mill Stock No. 1—Products of mechanical separation valued at $45 and over.

Mill Stock No. 3—Valued at less than $20.

Mill Stock No. 3—Valued at less than $20.

It is interesting to note that in 1911 and 1912, the shipments exceeded the output of the mining and milling operations for each respective year. This shows a steady evacuation of the stock on hand which had accumulated during 1910, when an abnormal production had caused a congestion of the market.

Therefore the balance between the output and shipments is gradually readjusting itself, and as the consumption is steadily increasing, the future of the industry is hopeful.

The following table shows the growth of the asbestos industry since the year 1900:

| Year. | Tons. | Value. |
|---|---|---|
| 1900 | 21,408 | $ 719,416 |
| 1901 | 33,466 | 1,274,315 |
| 1902 | 30,634 | 1,161,970 |
| 1903 | 29,261 | 916,970 |
| 1904 | 35,479 | 1,186,970 |
| 1905 | 48,960 | 1,476,450 |
| 1906 | 61,675 | 2,143,653 |
| 1907 | 61,985 | 2,455,919 |
| 1908 | 65,157 | 2,551,596 |
| 1909 | 63,965 | 2,296,584 |
| 1910 | 80,605 | 2,667,829 |
| 1911 | 102,224 | 3,026,306 |
| 1912 | 111,175 | 3,059,084 |

*Extracts from Report of Mining Observations in Quebec, 1912. Photos by Reginald E. Hore.

**AT BLACK LAKE, P.Q.**

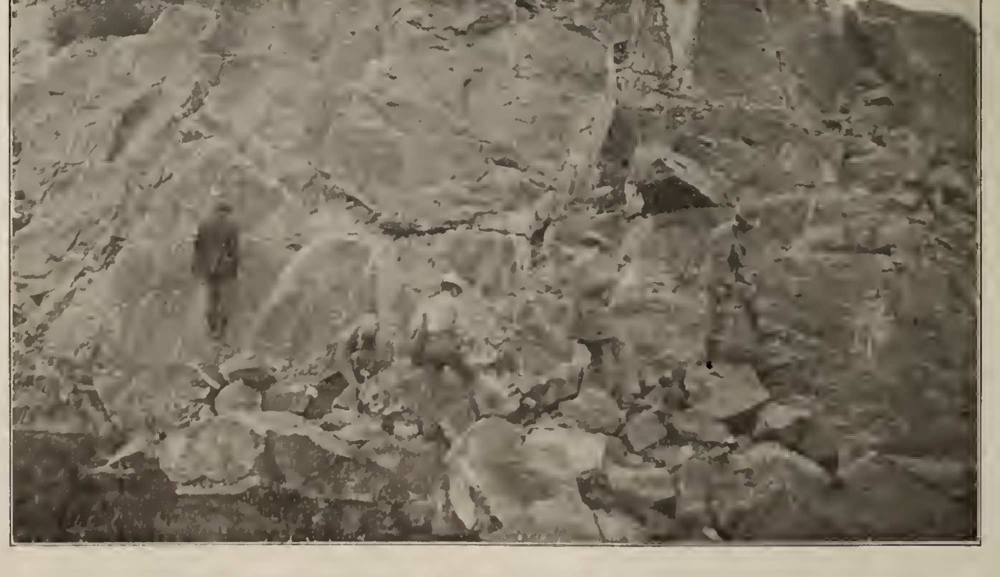
**Geologists looking for new minerals in the asbestos bearing rocks.**

The year 1912 therefore shows a new high record for both tonnage and total value. However, it must be pointed out that although the tonnage in 1912 increased 8.75 per cent. as compared with 1911, the total value only increased 1.07 per cent.

There is an increase in the demand for long fibre asbestos and a corresponding decrease for the lower grades. Spinning stock and shingle stock, which must be of clear and fibrous asbestos, find a much readier market than paper and mill-board stock, which are now much more difficult to get rid of. For this reason only the mines which are able to produce an appreciable quantity of the better stocks were operated this year. As a consequence of this state of things all the mines of the Broughton district were shut down during the whole of 1912. The serpentine rock in this district contains as a rule a high percentage of asbestos; this, however, is not in veins, but in the shape of short fibre disseminated throughout the rock. In the Robertson district, where the asbestos rock is of an intermediate nature between that of Thetford and that of Broughton, two mines were worked part of the time.

In Thetford and Black Lake, there was a serious shortage of labour which somewhat hampered operations.

One of the important features of the year in the asbestos industry has been the reorganization of two of the large operating companies. In both cases, the principle adopted in the reorganization has been the reduction of the bonds by converting part of these into common stock, thereby reducing the fixed charges. In these reorganizations, the names of two companies, the Amalgamated Asbestos Company and the Black Lake Asbestos Corporation, have been changed respectively to Asbestos Corporation of Canada, Ltd., and the Black Lake Asbestos and Chrome Company, Ltd.



**Geologists examining asbestos veins at Black Lake, P.Q.**

**Fred. Searls, Nevada; A. C. Lawson, California; C. P. Berkey, New York; J. B. Murray, London; Chas. Palache, Harvard.**

**At BLACK LAKE, P.Q.**

**Dr. J. A. Dresser describing the occurrence of asbestos to members of geological congress.**

Returns of shipments of asbestos were received from mine producers as follows:

Asbestos and Asbestic Co., Ltd., Danville, P.Q.

Asbestos Corporation of Canada, Ltd., Thetford Mines and Black Lake, P.Q.

B. and A. Asbestos Co., Robertson, P.Q.

Bell Asbestos Mines, Thetford Mines, P.Q.

Berlin Asbestos Co., Rumpelville, P.Q.

Black Lake Asbestos and Chrome, Black Lake, P.Q.

Jacobs Asbestos Mining Co., Thetford Mines, P.Q.

Johnson Co., Thetford Mines, P.Q.

Martin, Bennett Asbestos Mines, Ltd., Thetford Mines, P.Q.

The Asbestos Corporation of Canada operated four of their mines, the Kings and Beaver mines at Thetford, and the British Canadian and the Standard mines at Black Lake. The fifth mine, the Dominion at Black Lake, was not re-opened.

The Black Lake Asbestos and Chrome Co., Ltd., have actively worked the Union and the Southwark mines. Their large mill has a capacity to treat 1,000 tons of rock per 10 hours. The motive power is electricity.

The Bell mines are the only ones in the district who have done much underground development by means of tunnels. These aggregate in the vicinity of 20,000 lineal feet, which have developed a large reserve of asbestos-bearing rock.

The mill has a capacity of 900 tons of rock per 10 hour shift. In their mining and milling operations the Bell mines use 1,200 h.p., of which about one-half is electric power, and one-half is furnished by steam boilers.

The Asbestos and Asbestic Company, Ltd., are the only ones working in the Danville district. They operate the Jeffrey mine at Asbestos. This company was in continuous operation during 1912. There are two

**AT BLACK LAKE, P.Q.**

**Examining crystals of white garnets found in the asbestos bearing rock.**

**Robert Harvie, Ottawa; Dr. Charles Palache, Harvard; Dr. A. C. Lawson, California.**

well equipped mills, of a capacity of 1,000 tons of rock each per 10 hours. Provision is made for about 2,000 h.p., partly steam and partly electricity.

The Johnson Company operate two mines, at Thetford and Black Lake respectively. Each mine has its own mill, and both were in continuous operation during the year.

At both mines and mills steam power is used exclusively. The capacity of the Thetford and Black Lake mills of the Johnson Company aggregate 750 tons of rock per 10 hours.

The Jacobs Asbestos Mining Company operate on lot 28 in the sixth (VI.) range of Thetford. Their well equipped mill has a capacity of 600 tons of rock per 10 hours. Electric power is used exclusively in operating both the mines and the mill. The horse power used is about 700.

The Martin-Bennett Asbestos Mines, Ltd., is the latest addition to the Thetford mines. This company acquired the Ward-Ross property, situated near the Johnson mine. It had been lying idle for a great many years owing to litigation. The new mill, which is very complete and efficient, was put in operation in the spring of 1912. It has a capacity of 900 tons of rock per 10 hours. In their mines and milling operations steam power is used exclusively.

The B. and A. Asbestos Company operate on lot 9 in the fifth (V.) range of Thetford, at Robertsonville. The mill has a capacity of 450 tons per 10 hours. Electric power, 600 h.p., is used exclusively in both mining and milling operations.

The Berlin Asbestos Company have their mine and mill on lot 2 in the fifth (V.) range of Thetford. The mill has a capacity of 450 tons per 10 hours. The mining and milling operations require 400 h.p. The two last mines were only operated during a part of the year.

The electric power is distributed in the asbestos districts by two electric power companies, the Continental Light and Power Company and the St. Francis Hydraulic Company. The first of these obtain the power from Shawenegan Falls, on the north side of the St. Lawrence River. Two lines of 80 miles deliver 9,000 h.p. in Thetford, Black Lake, Robertson, East Broughton and Danville.

The second company has its plant at the falls of the St. Francis River, two miles above Disraeli. They develop 3,000 h.p. and have an auxiliary steam plant of 2,000 h.p.

The price of electric power in these districts averages $25 per h.p. for eight month to during the year, as generally during the winter months mining operations are considerably reduced.

It is noteworthy that there is now a growing tendency towards using steam power in mining and milling operations. The contention is that although electric power at the rate at which it is delivered would be cheaper for continuous operations, as there sometimes occur long interruptions in the work owing to various causes, such as shortage of labour, sluggishness in the asbestos market, unfavourable weather to work in the asbestos pits, etc., it is more profitable to install a boiler plant and produce steam power. The price of good steam coal on the cars at Thetford or Black Lake during 1912 was $5 per gross ton.

**Cobbing Asbestos, Black Lake, P.Q.**

## THE OUTPUT OF COPPER IN AUGUST.

The Boston News Bureau states that the copper production for August by 26 producers approximated 81,413,124 pounds, compared with 99,540,194 pounds last year, a decrease of 18,127,070 pounds. This sharp drop was directly due to the suspension of operations in the Lake Superior district. The last half of the month witnessed resumption on a small scale at Calumet and Hecla, Copper Range and Quincy, but it is very improbable that the combined output from these properties exceeded 4,000,000 pounds, which would compare with a normal monthly production of the camp of from 18,000,000 to 20,000,000 pounds.

The porphyries—Utah, Chino, Nevada Consolidated, Ray Consolidated and Miami—outputted last month 30,019,348 pounds, an increase of 1,854,320 pounds over August, 1912.

## NIPISSING.

Nipissing Mining Company report as of September 20, shows: Cash on hand, $1,192,297; ore and bullion in transit, $24,245; ore on hand, $182,980; total, $1,399,522.

# CANADA'S NICKEL INDUSTRY*

By Alexander Gray.

The nickel industry of Canada, centred in Ontario, was pre-natally endowed with the mineral-bearing rocks essential to it, and unparalleled in their extent and characteristically contained worth.

That much is conceded by those who have scientifically investigated the norite of the Sudbury District and by those who tediously nurtured the industry with capital and all the metallurgical, mining and metal market sciences afforded.

Nickel and copper in intricate association confounded the issues and caused pioneer capitalists and their metallurgists ruefully to confess they would be happier "with either were t'other dear charmer away." Moreover, the metallurgy of the ores had been economically solved, nickel had to await its adaptation to multifarious uses—and abuses, in the estimation of those who frown upon naval armaments.

It took so many millions to separate and popularize nickel, so many years to introduce it into the manufacture of armour plate and innumerable art—those familiar with the inner details of that paroxysmal period cannot begrudge honours and emoluments to those who made nectar with a "lemon," so to speak. Nor is it surprising in the circumstances, that most of those who jauntily undertook to engage in or participate in the nickel industry, usually came to grief.

Notwithstanding the undisputed magnitude of the natural resources of the Sudbury District in respect to these ores, the difficulties attending the refining of nickel—and marketing of the metal in large and continuous quantities sufficient to bring adequate return upon capital invested—were painfully prolonged and deterred others than those who had to furnish money in bulk to the International Nickel Company and the Mond Nickel Company. Repeated attempts by ill-equipped concerns, ended in ignominious failure, emphasizing the futility of mere promoters entertaining what exacted the unceasingly expensive energies of wealthy and skilled technical chiefs, who had devoted so much time and money to their problems they could not abandon the field.

Opportunity for competitive enterprise and a somewhat envious environment could not induce other than the Mond Company and the International Nickel Company to do little more than acquire nickel-copper-bearing areas. Occasionally mining has been pursued. The Dominion Nickel-Copper Company organized by influential Canadians; the Lake Superior Corporation; the Montreal owners of the Worthington property, all knew they had ore and devoted themselves to explorations by diamond drilling. Plants and a railroad to what is defined as the North Nickel Range, sustained by representations as to the feasibility of certain separating and refining processes, did not get beyond the contemplative. Speculators holding properties of real or problematic merit could not enthuse financiers and steel-makers into the erection of smelters. Repeatedly inquiry for properties failed to get beyond preliminaries.

Not until quite recently when expansion brought to the two producing companies named, the profits they had earned as their reward for constructive capital outlays, has it appeared at all possible to enlist anyone competent to effect the economical separation of the metals and market the same. Even now—and in spite of the support given by noted personalities—there is a halt in the programme of those who took over the holdings of the Dominion Nickel-Copper properties, along with the Murray Mine and other areas amalgamated as the Canadian Nickel Corporation with a nominal capital of $30,000,000. Whatever the inducement presented in these outstanding nickel properties—and, however, ambitious individuals may be to contest nickel markets with the International and Mond Companies—those best informed appreciate what the rivalry will entail.

Had the Messrs. Guggenheim, with their metallurgical staffs and mastery of metals markets, succeeded in obtaining the properties massed under the aegis of the Canadian Nickel Corporation, a battle royal might have ensued. The Guggenheims were willing. Somehow there was a misdeal. While certain of the Canadian owners favoured the American Mining and Smelting Masters, Messrs. J. R. Booth and Clifford Sifton closed with Dr. F. S. Pearson, E. R. Wood, Z. A. Lash, Sir William Mackenzie and others, for a round four or five million dollars in cash and script. Mr. J. E. McAllister, managing director of the Canadian Nickel Corporation, and adviser in the matter to Dr. Pearson, was alert. He took the trick—and it remains to get the $10,000,000 as proposed by a debenture issue and a bonus of 125 per cent. of common stock, leaving $7,500,000 of the $20,000,000 of common stock to be otherwise disposed of. When that is accomplished, possibly there will be a third formidable nickel corporation, bringing the capitalization of the entire Ontario nickel country to over $80,000,000, exclusive of what is in the Micawber class of holders and including the Alexo Company, operating near Kelso and shipping their ore to the Mond smelter.

Yet it is almost thirty years since Dr. Howie discovered the pyrrhotite and chalcopyrite on the surveyed line of the Canadian Pacific Railway, on the site of the Murray Mine which the Vivians subsequently operated and abandoned twenty years ago, now said to contain more ore of higher grade than those original nickel refiners at Swansea dreamed of. Had the Vivians retained the Murray and proved its worth, they would have become larger factors in nickel markets. It bespeaks the perplexity permeating Nickeldom that the very property which the Vivians declined to longer operate in 1894, was the 1913 basis of the transaction now in process of consummation with the Pearson interest. It would add to the ironies if the Mond English Company contracted for a considerable tonnage of newly discovered Murray ore.

Ordinarily a mineral industry requiring a quarter of a century to mature to the profit-distribution stage, would be regarded as a glorified "wild cat." Assuredly the nickel industry had a career that was precarious and vicarious simultaneously. Most of the "mystery" attached to it was due to the fact, for years, that nickel-making was unspeakably hazardous. There were no beplumed Chanticleers around Copper Cliff and Sudbury; because those preoccupied with their work had to strut softly so as not to arouse those who subscribed their millions and existed on a slim diet of hope deferred.

That the fixed capital of Ontario's Nickel Company is approaching the $100,000,000 mark, does not warrant the assumption that the production of the metal is to be accomplished any easier, further than that there are

*From Journal of Commerce, Sept. 13 and Sept. 20, 1913.

multiplying uses for it when competitors can supply it upon terms relatively as satisfactory as those companies now dominating nickel markets. How formidable these latter have become, in that they contribute about 80 per cent. of the world's nickel, is illustrated by the following progressive Bureau of Mines tables giving the Ontario output and value by years, since the organization of the International Nickel Company in 1902:

companies is not repeated as a disastrous experiment with mining industrial matters exacting thorough organization and sane finance. Necessarily the output of the producing nickel mines has conformed to demand. Supply never was at issue since the Sudbury District ores and the solution of their treatment. Were the world prepared to take more nickel—at a price that would yield a satisfactory profit—the world could have it, and the turn over

## NICKEL AND COPPER PRODUCTION OF ONTARIO MINES

| | 1902. | 1903. | 1904. | 1905. |
|---|---|---|---|---|
| Production Details— | Tons. | Tons. | Tons. | Tons. |
| Ore raised | 269,538 | 152,940 | 203,388 | 284,090 |
| Ore smelted | 233,388 | 220,937 | 102,844 | 257,745 |
| Ordinary matte produced | 24,691 | 40,416 | 19,123 | ...... |
| High grade matte produced | 13,332 | 14,419 | 6,926 | 17,388 |
| Nickel contents | 5,945 | 6,998 | 4,743 | 9,503 |
| Copper contents | 4,066 | 4,005 | 2,163 | 4,525 |
| Value of nickel | $ 2,210,961 | $2,499,067 | $1,516,747 | $3,354,934 |
| Value of copper | 616,763 | 583,646 | 297,126 | 688,993 |
| Wages paid | 835,050 | 746,147 | 570,901 | 833,822 |
| | Number | Number | Number | Number |
| Men employed | 1,445 | 1,277 | 1,063 | 1,176 |

| | 1906 | 1907. | 1908. | 1909. |
|---|---|---|---|---|
| Production Details— | Tons. | Tons. | Tons. | Tons. |
| Ore raised | 343,814 | 351,916 | 409,551 | 451,892 |
| Ore smelted | 343,059 | 359,076 | 360,180 | 462,336 |
| Ordinary matte produced | ...... | ...... | ...... | ...... |
| High grade matte produced | 20,364 | 22,041 | 21,197 | 25,845 |
| Nickel contents | 10,776 | 10,602 | 9,563 | 13,141 |
| Copper contents | 5,260 | 7,003 | 7,501 | 7,873 |
| Value of nickel | $ 3,839,419 | $2,270,442 | $1,866,059 | $2,790,798 |
| Value of copper | 806,413 | 1,020,913 | 1,062,680 | 1,212,219 |
| Wages paid | 1,117,420 | 1,278,694 | 1,286,265 | 1,234,804 |
| | Number | Number | Number | Number |
| Men employed | 1,117 | 1,660 | 1,680 | 1,796 |

| | 1910. | 1911. | 1912. |
|---|---|---|---|
| Production details— | Tons. | Tons. | Tons. |
| Ore raised | 652,392 | 612,511 | 737,656 |
| Ore smelted | 628,941 | 610,788 | 725,065 |
| Ordinary matte produced | ...... | ...... | ...... |
| High grade matte produced | 35,033 | 32,607 | 41,925 |
| Nickel contents | 18,636 | 17,049 | 22,421 |
| Copper contents | 9,630 | 8,966 | 11,116 |
| Value of Nickel | $2,005,961 | $3,664,474 | $4,722,040 |
| Value of copper | 1,374,103 | 1,281,118 | 1,581,062 |
| Wages paid | 1,698,184 | 1,830,526 | 2,357,889 |
| | Number | Number | Number |
| Men employed | 2,156 | 2,439 | 2,850 |

**Recapitulation.**

| | |
|---|---|
| Tons raised | $4,469,688 |
| Tons smelted | 4,301,365 |
| F.O.B., Sudbury value of nickel | 28,722,414 |
| F.O.B., Sudbury value of copper | 14,453,331 |
| Wages | 13,789,802 |

Obviously 31.9 per cent. of the Sudbury valuation of the nickel-copper contents of the practically four-and-a-half-million tons raised was paid out to employees of the Canadian Copper Company, which is the producing organization of the International Nickel Company; the Mond Company—and latterly, in a mall way, the Alexo Company. As obvious is it that the nickel industry is at its best—a best that will be more superlatively so if markets for the metal are conserved and the demoralization due to random promotion of asbestos

on capital would compensate somewhat for any reduction in the market price of the metal. But the world shied at more than so much—consequently the companies engaged in supplying it had to modulate their output and conform to the momentary requirements.

Inspection of the foregoing tables will convince economists that financial depression—periodic depressions—automatically influenced the nickel output. Had the situation been what the Englishman describes as "all beer and skittles"—otherwise defined as "all jam" —the International Nickel Company sooner might have begun to "get back some of its money." Just as the nickel industry was beginning to benefit from enlarged markets, the 1907 panic occurred. It will be observed that the 1907 aggregate was but a trifle in excess of that of 1902, the year in which the International Company went into the business; also it is clear that the 1908 output was below that of 1902 or of 1907.

Since then the output has almost doubled—and the ore reserves have multiplied so enormously that the leading companies are safeguarded. Concurrently there have been necessary enlargements of plants and properties, more capital has been forthcoming—and the markets secured by long-term contracts or by demonstrated ability to furnish metal markets with "the goods."

The International Nickel Company raised 618,294 of the 737,656 tons of ore smelted in 1912. The Mond Company raised 117,568 tons and took 1,792 tons of ore from the Alexo Company. In other words, the International Company produced over 80 per cent. of the Canadian tonnage. This is about the usual proportion. Doubtless the International Company's contribution of nickel was in greater ratio, for 518,417 tons was high-grade ore from the unexcelled Creighton Mine—a mine that was a saving clause during those unprofitable years when the International Company was in what aviationists speak of as the "upper air currents." At any rate the International and Mond Companies accounted for 99.75 per cent. of all the nickel ore mined in Ontario in 1902—and they are prepared to beat that record, if markets will take the metals. The Alexo tonnage was bought by the Mond for its high nickel content, the low copper content being no deterrent; because Mond matte shipped to Wales contains more nickel than what is many craves a freer market in nickel, but its manufacturers side-step all proposals that they engage in mining and refining the metal. Meanwhile the International Company possesses sufficient ore reserves proved to maintain the current output for about 75 years and has funds on hand for extensions to plant. Not only will the No. 3 Mine be equipped upon an unprecedented scale, but another hydro-electric plant will be constructed next year on the Spanish River, thus doubling the power capacity. Power, tonnage, plants, cash and markets, bespeak the achievements of those who brought the International Company to the point where those who would measure swords with it must have greater dexterity, a better eye—and the essential sinews. How potential are International and Mond Companies may be determined by these figures:

**World's Production of Nickel.**

| Years. | Metric Tons. | Ontario Output Tons. |
|---|---|---|
| 1906 | 14,300 | 10,776 |
| 1907 | 14,100 | 10,602 |
| 1908 | 14,600 | 9,563 |
| 1909 | 17,300 | 13,141 |
| 1910 | 20,100 | 18,636 |
| 1911 | 24,500 | 17,049 |
| 1912 | 26,500* | 22,421 |

*Estimated.

## INCOME ACCOUNT OF THE INTERNATIONAL NICKEL COMPANY

| | 1912-13. | 1911-1912. | 1910-1911. | 1909-1910. |
|---|---|---|---|---|
| Earnings of constituent companies | $6,802,886 | $5,019,703 | $5,207,521 | $3,339,457 |
| Other income | 126,220 | 69,263 | 49,416 | 9,223 |
| Total income | 6,929,107 | 5,088,966 | 5,256,938 | 3,348,681 |
| Exp. taxes, etc. | 542,308 | 22,553 | 228,064 | 203,947 |
| Net income | 6,386,799 | 4,866,413 | 5,028,874 | 3,144,734 |
| Interest, Sinking Fund, depreciation, etc. | 1,366,494 | 1,284,453 | 1,253,274 | 1,077,206 |
| Surplus | 5,020,305 | 3,581,960 | 3,775,600 | 2,067,528 |
| Preferred dividends | 534,755 | 534,749 | 534,748 | 534,745 |
| Balance for common | *4,485,550 | 3,047,211 | 3,240,852 | 1,532,783 |
| Common dividends | 3,491,049 | 2,143,412 | 808,778 | 487,978 |
| Surplus | 994,501 | 903,799 | 2,432,074 | 1,044,805 |

*Equal to 11.79 per cent. on $38,031,500 common stock.

sent by the Canadian Copper Company to the Orford Company in New Jersey in behalf of the International Company. So strongly entrenched are the two producing companies, even a fraction of their trade at other than sacrifice prices will be difficult to dislodge. They have prospered despite adversities which would have discouraged the less capable, however fiscally equipped.

Copper Cliff and Coniston Smelters as perfected and trebled have the economies long sought by the technical experts of the International and Mond Companies. Cheaper processes—and as efficient—there may be. Canadians interested in their material resources cherish the desire for a still greater nickel industry—but those who plan nickel enterprises will have to make more than a sporting bet. As yet Canadian consumption of nickel is a negligible factor. The bounty awaiting nickel refined in Canada has not enticed capitalists to provide metallurgical works in Canada for that special purpose. Ger-

While the Ontario industry has advanced 110.8 per cent. in those eight years the world's supply has increased 85.3 per cent. Having in view the Ontario Mines Department detailed data as to the output and spending power in wages of the Ontario nickel industry, it is pertinent to present the consolidated income account of the International Nickel Company in recent years:

The entrenched position of the International Nickel Company and the war chest to provide ammunition and the commissariat, and enable it to withstand a siege. On March 31st, the end of its last fiscal year, it had a cash surplus of $4,442,664, as compared with $3,854,177 in 1912; $2,852,102 in 1911, and $1,455,836 in 1910. What is more significant is the recent financing by which all the bonds of the company were retired, thereby eliminating fixed charges and putting more millions into plants and the treasury. Over $8,000,000 in bonds were redeemed in furthering the company's purposes, greatly enlarged facilities are to be a feature—and this while meeting dividends on the increased common. The dividend record by years and the annual surplus disclosed were as follows, despite heavy capital expenditure by which earnings were reinvested:

**Dividend Record International Nickel Co.**

| Year. | Per cent. on common. | Year's Surplus. |
|---|---|---|
| 1912-1913 | **11.7 | $994,501 |
| 1911-1912 | 26.3 | 903,798 |
| 1910-1911 | 17.9 | 2,432,074 |
| 1909-1910 | 17.2 | 1,044,805 |
| 1908-1909 | 5.3 | 470,671 |
| 1907-1908 | 8.9 | 790,009 |
| 1906-1907 | 14.2 | 1,254,769 |
| 1905-1906 | 8.6 | 754,760 |
| 1904-1905 | 7.8 | 668,093 |
| 1903-1904 | *3.8 | 341,102 |
| 1902-1903 | *6.4 | 559,149 |

*Earned on the Preferred Stock.

**Common Stock increased from $11,582,626 to $38,031,500.

International Company shareholders had to exercise patience. There was no dividend on the preferred shares for four years following the organization of the company. It was eight years before the common issue brought any return, owing to the necessity for re-investing surplus in plants. However, of late years, dividends have been as follows:

| | Preferred Dividends. | Common Dividends. |
|---|---|---|
| 1913 | $534,754 | $3,491,048 |
| 1912 | 534,749 | 2,143,411 |
| 1911 | 534,748 | 3,126,859 |
| 1910 | 534,745 | 487,977 |
| 1909 | 534,733 | ...... |
| 1908 | 534,733 | ...... |
| 1907 | 534,730 | ...... |
| 1906 | 267,360 | ...... |
| | $4,010,552 | $9,149.295 |

In 1912-13 the sum of $1,051,920 was written off for depreciation to plants and exhaustion of ore—notwithstanding the millions of tons added to the ore reserves. It is conservative administration policies, such as this, which made the International Company a model in Canadian mining, reinforced as they are by what was intimated in the most recent annual report:

"We are continuing to keep our plant up to date in every respect, increasing its efficiency wherever possible, and enlarging its capacity."

So close is the nickel organization to-day it rests with the dominant companies to meet the market conditions at the moment, or over contract periods. A trifle less than 13 per cent. of the 44,221,860 pounds of nickel contained in the matte exported, went to Great Britain in 1912. The actual exports were:

| | Lbs. |
|---|---|
| To Great Britain | 5,072,867 |
| To United States | 39,148,993 |

Whereas the total as applied to Great Britain reflects a gain of 9 per cent., that for the United States represents a gain of 41.9 per cent. Therefore the importance of the American market, and a tariff which permits unrefined metal to enter the States as such, requires little emphasis. America takes the business—and caters for it, otherwise it could easily alienate a goodly portion of it. Canada has a very substantial first profit—not anywhere near to being measured by the wage items from year to year. For this we have the authoritative pronouncement by Dr. A. P. Coleman in his most complete monograph on the nickel industry published by the Dominion Department of Mines. He says:

"The whole nickel basin includes an area of 550 square miles, divided among twenty-four townships of the regular size and shape. Mining has taken place in eight of these ten townships, while important ore deposits are known to exist in several others.

"Omitting the villages connected with the farming region of the interior basin, the nickel mining industry supports two towns, Sudbury and Copper Cliff, and four villages, with a total population of perhaps 10,000 people."

We have the authority of the Ontario Mines Department for the statement that 4,459,688 tons were raised since 1902, and to the end of 1912. Throughout the operations, and dating back to the 80's, we have the authority of Dr. Coleman for the assertion that "the total amount of ore mined in the region up to the present (1912) is roughly 5,500,000 tons, of which probably 4,000,000 were actually sulphides, containing perhaps 2,400,000 tons of iron and its associated metals, nickel itself amounting to about 133,000 tons. . . . . More than half the total has come from the few hundred feet of margin at the Creighton Mine, so that things are very unequally distributed."

Substantiating this Dr. Coleman also says "the Creighton has of late years been by far the most productive nickel mine in the world, with its annual output of more than 200,000 tons of ore containing on the average 4.68 per cent. of nickel and 1.65 of copper. The total production up to the end of 1910 was 2,088,531 tons, and mining at the regular rate has gone on steadily since that time. The annual production of nickel from this mine has probably surpassed that of all the other nickel mines in the world."

The same gentleman, who has devoted years to the study of the nickel country, states that "the Creighton ore up to September, 1910, contained on the average 5.08 per cent. of nickel and 1.63 of copper with a total for the two metals of 6.71 per cent., making it the richest of the large mines with the exception of Copper Cliff. Crean Hill ore approaches it, but with the proportion of the two metals reversed. It is also the richest in the sulphides of all the large mines, or in other words, contains less rock matter than the others, 75 or 80 per cent. of the ore being sulphides. It has shown slight falling off in grade since the earlier years, since more rock is now included with the ore, but the sulphides seem to be very uniform in their average contents of nickel and copper."

Without intending to make comparisons which might be deemed invidious, the metallic contents of the basic Creighton ore saved the day for the International Nickel Company when duly supported by that from the Crean Hill and Copper Cliff mines. Such high grade ore made it easier for metallurgists and those in charge of metal markets in behalf of the International Company to make dividends and equip the properties. Combined with all of this is the proved ore reserves in the numerous areas owned by the International Company. Whether those reserves actually total 50,000,000 or 60,000,000 with—more to come—they are ample for all emergencies. Presently the Frood, or No. 3 Mine, will place the International Company in a very strong position. Some idea of this Frood section will be conveyed to the laity by this extract from Dr. Coleman's monograph:

"The widest part of the band of norite and gossan is 900 feet across, a little to the South of the Frood Mine; and the whole gossan-covered area far surpasses any other in the nickel region, being probably four times as large as the gossan surface at Creighton or Whistle mines, which come next to it. It was an axiom of the early prospectors that a large area of gossan meant an important ore body, and in this case at least their belief was justified. . . Though No. 3 mine was found early in the history of the region, it was not worked, beyond some stripping and the sinking of pits, until 1899. In the following year a railway switch from the Stobie mine gave an outlet for ore from the mine, but four years later, in 1903, the mine was closed down after 107,942 tons of ore had been sent to the Copper Cliff smelter. The ore ran 2.66 per cent. of nickel and 1.39 per cent. copper, the two metals making up 4.05 per cent., so that it was considerably richer than its neighbour the Stobie mine.

"The results of systematic diamond drilling across the ore deposit by the Canadian Copper Company (the operating end of the International Nickel Company) have since proved the amount of ore of a similar grade to be enormous, certainly 35,000,000. . . . . The Canadian Copper Company also is sinking three compartment shaft to a depth of 500 feet and building a direct railway to Copper Cliff, giving a much shorter connection than the former roundabout route past Stobie and Sudbury. It may be expected that this greatest of known nickel deposits will soon be sending ore to the smelters of the two producing companies, and adding greatly to the available supply of the region."

(To be continued.)

# GRANBY CONSOLIDATED COMPANY'S MINE AT PHOENIX, BRITISH COLUMBIA

By O. E. Leroy.

The production of the Boundary district (including the Osoyoos Mining Division) from 1896 to the end of 1912 amounts to 13,744,338 tons of ore, containing 938,125 ounces of gold, 5,035,953 ounces of silver, and 334,874,378 pounds of copper, having a gross value of $73,312,913. Approximately 60 per cent. of the tonnage was furnished by the mines at Phoenix.

The copper-bearing portion of the Boundary district occupies an area of about 25 square miles, and includes the important centres of Phoenix, Greenwood (Deadwood) and Summit. It was in 1891, following the discoveries at Rossland, that prospecting was actively carried on in the three above named camps. In that year most of the ground subsequently proved to be productive was staked. The low grade character of the ore proved a great disappointment which was partially offset by the discovery that the ore was almost self-fluxing. The field, however, was open only to large companies with financial resources beyond those of the average individual. The two companies at present operating were early in the field; the Granby Consolidated Mining, Smelting and Power Company confining its attention to Phoenix, and the British Columbia Copper Company operating at Deadwood and Summit. The smelter of the former was built at Grand Forks and the first furnace blown in in 1900. Its capacity has been increased from 1,200 tons to between 4,000 and 4,500 tons per day. The latter company commenced smelting at Greenwood in 1901. The present capacity of its furnaces is about 2,600 tons per day.

**Ore Deposits.**—The copper deposits occur at intervals along the edges of zones of contact metamorphism and also at the base of the zones or in some non-outcropping intermediate position.

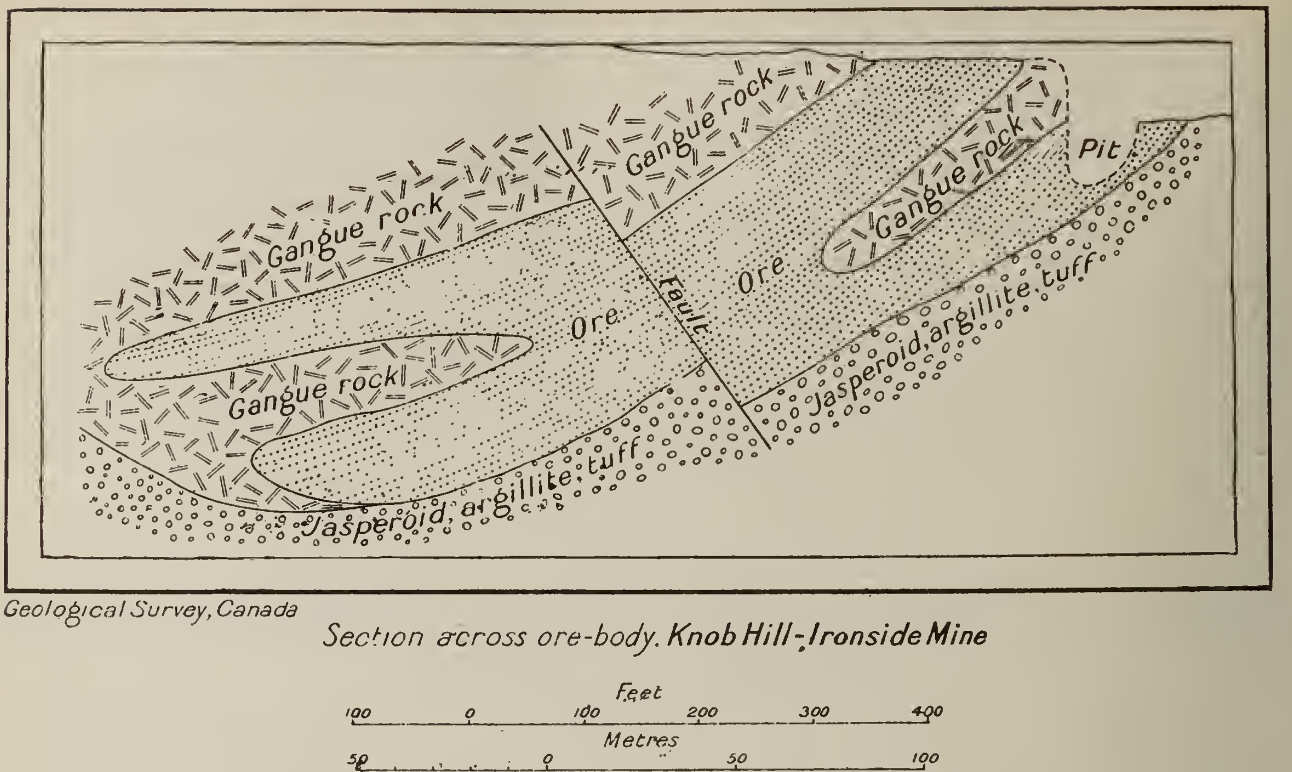
The zone in which the principal deposits occur is horseshoe-shaped. The west limb is 3,200 feet long and 1,000 feet wide, while the east limb is 2,250 feet long and from 350 to 1,000 feet wide. The thickness varies from one foot or so to 350. The floor is jasperoid or in places the siliceous rocks of the Knob Hill group.

**Knob Hill Ironsides Mine.**—The ore body of this mine owned by the Granby Consolidated, is the largest and most typical of the camp. The ore body is composite in character and consists of two lenses which coalesce about their central portions. Along the outcrop these appear as distinct ore bodies separated by a varying thickness of the lime-silicate gangue rock. The western lens is at least 2,500 feet long, from 370 to over 900 feet wide, and from 40 to 125 feet thick. The eastern lens is apparently shorter, but approaches the magnitude of the other in width and thickness. The general strike along the outcrop is about N. 10° E. with dips to the east ranging from 45 to 60 degrees. The dip flattens with depth and on the lower levels averages from 15 to 30 degrees. The general pitch of the ore bodies is about 18 degrees to the northeast. The vertical range from the south end of the main "glory hole" to the lowest working levels is 675 feet. The structural footwall is the jasperoid zone of the Brooklyn formation, and in places, the siliceous rocks of the Knob Hill group. The hanging wall is a purely commercial one and the ore either grades insensibly into barren gangue or terminates sharply against a gouge-filled fissure. The ore bodies and adjacent rocks are traversed by an intricate system of fissures which run in all directions and dip at all angles. They have had a most important influence on ore deposition as they formed channels for the ore-bearing solutions which permitted a uniform distribution of their metallic contents. In many cases the ore adjacent to these fissures is of noticeably higher grade. Some of the fissures have been subsequently filled with banded quartz, calcite and chalcopyrite.

The only displacement noted is along one of the major fissures which faulted the ore body with a throw varying from zero to 120 feet along a dip of 55 degrees to the west.

The ore is mainly massive with local banded areas. It consists of chalcopyrite, which with pyrite and hematite is finely and uniformly distributed through a gangue composed almost exclusively of garnet, epidote, quartz, calcite and chlorite. The pyrite occurs

*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.




Geological Survey, Canada

*Section across ore-body. Knob Hill-Ironside Mine*

in grains, crystals and streaks, while the hematite (specularite) occurs in platy aggregates. Magnetite occurs in masses and irregular lenses at intervals through the ore bodies, but it is relatively unimportant. The average content of the ore is: copper 1.25 per cent.; gold 0.04 ounces, and silver 0.3 ounce per ton. Along the outcrop the ore has been leached out in part but has produced no noticeable secondary enrichment at lower levels.

The zone of contact metamorphism and the development of lime-silicates is believed to have been the result of metasomatic replacement of limestone by solutions above the critical temperature carrying ferric iron, alumina and silica and consisting mainly of water gas strongly ionized. Epidote and garnet, etc., were formed, and the magnetite was probably formed contemporaneously with them. When the formation of the above was well advanced the character of the solution changed somewhat and chalcopyrite, pyrite and hematite were deposited in and along the numerous minute fissures and cavities in the lime-silicates. Calcite and quartz were the last to deposit and completely filled the remaining minute spaces. In the absence of any direct evidence, as there are no large bodies of igenous plutonic rock in contact with or adjacent to the zone of contact metamorphism at present, it is suggested that these zones were overlain by more or less irregular and thick sheets of granitic rock, and that these were the cause of the metamorphism of the limestone and the source of the mineral bearing solutions. The circulation would thus be descending and lateral and would account for the ore bodies terminating abruptly at comparatively shallow depths either against jasperoid or crystalline limestone. The age of the deposit is referred to as post-Jurassic or the period immediately following the intrusions of the granodiorite batholith of the Boundary district. The ore bodies suffered from erosion in the early Tertiary and are overlain unconformably by Oligocene sediments.

**Method of Mining.**—The ore bodies are mined along their outcrops by large open quarries or "glory holes" and underground by a system of tunnels and shafts. Stoping by the pillar and room method is used entirely below the level of the "glory holes." The development work is based on the information gained by extensive prospecting with diamond drills.

## MICHIGAN MINE MANAGERS REFUSE TO RECOGNIZE WESTERN FEDERATION.

Following a meeting of the mine managers, Saturday, Sept. 20, a reply was delivered to John H. Moffit, federal emissary at Houghton, to offer the good offices of the United States Government in effecting a settlement of the Michigan copper miners' strike. Mr. Moffit made a proposal to the mine managers last Wednesday. The text of his proposal was not made known, but the reply yesterday was to the effect that the mine managers and companies are inflexible in their purposes not to treat in any way with the Western Federation of Miners, not to consider that organization as a party to any proposed arbitration of the present labour trouble.

The text of the reply, signed by every mine manager in the district says:

"Honourable John A. Moffit, special representative U. S. Department of Labour. Dear Sir: The undersigned, being managers of the copper mines of the counties of Houghton and Keweenaw, in the State of Michigan, desire to express to you their most sincere appreciation of your offer of the good offices of the department in bringing about an adjustment of the existing strike, involving part of the mine workers of our companies, submitted to us in yours of Sept. 16.

"The first offer submitted by you begins with the proposition, 'That all of the issues involved in the strike shall be settled by arbitration.'

"The real issue involved in the strike is recognition of the Western Federation of Miners as an organization entitled to represent through its officials, the mine workers of the district. This has been publicly announced in speeches and in print by the officials of that organization themselves.

"In like offers of mediation made by the Governor of Michigan personally and through personal representatives appointed by him and acting by his authority, we have heretofore definitely declined to treat with the Western Federation of Miners, either directly or indirectly. This conclusion was arrived at in the first instance because of the past history of the federation in its operations throughout the mining districts of the west; because it was and is our firm conviction that the domination of the employees of the mining companies by that federation would not be to the best interests of our employees themselves; and because the federation was entirely unjustified in attempting to speak as the representatives of our employees for the reason that, according to our best information at the time of the inception of the strike, confirmed by all the information which we have obtained since then, their number did not exceed twenty-five per cent. of the employees of the companies (and in many instances a much smaller percentage) were members of the organization and the large majority of our employees were not willing to be dominated by that organization.

"It should also be recognized that because of the attitude of the officers, leaders and organizers of the Western Federation towards the mining companies and their officials and employees, there could not be a resumption of mutual relations and good will and confidence between employers and employees so long as the employers or any part of them are under the influence or domination of the federation. This should be apparent from the nature of the teachings and utterances of the officers, leaders and organizers of the Federation, as set forth in their published speeches and in their official publications.

"**Large Force at Work.**—All of the larger mines of the district have resumed operations with a large portion of the normal forces of their employees, who are entirely satisfied with conditions. In the case of the Calumet and Hecla, after deducting from the normal force those who are known to have removed from the district by reason of strike conditions or for other reasons, from 80 to 85 per cent. of its employees have returned to work and are now engaged in their several occupations. Similar conditions (with varying percentages) exist at the other larger mines of the district which are now in operation.

"Under these circumstances it is our judgment that we would be remiss in our duties towards the great majority of our employees if we should take any action which in any manner would recognize the Western Federation of Miners as the representatives of the mine workers or as dictating or dominating the actions of our employees, even to the extent of an arbitration as to their right to recognition or as to any other difference, real or fancied, which the federation may urge.

"For these reasons, among many others which might be mentioned, we must adhere to our position that we will in no manner deal with the Western Federation of Miners, either directly, through mediation, arbitration or in any other way.

"**The Only Demand was for a Conference.**—The only issue involved at the time the strike was called by the Western Federation of Miners was our refusal to enter into any conference with a committee of representatives of the federation. The only demand that was made was for such a conference, with a statement that if we were not willing to meet the officials of the Western Federation of Miners it would be taken as proof that the situation could not be settled peaceably.

"**No Grievances Submitted.**—We have had no other grievances submitted to us in any way, either officially or otherwise. This was not a grievance of our employees, but was a grievance of the federation represented by their officials and organizers from other states, who are entirely unjustified in making any claims to a right to represent the employees of the mines of this district.

"Both of your propositions as submitted by you, involve arbitration or discussion by or with committees, a part of them to be chosen 'By the mine workers now on strike.'

"The mine workers now on strike are those only who are members of the Western Federation of Miners. As above stated, they constitute but a small part of our employees. No method of choosing or appointing arbitrators or committees by 'the mine workers now on strike' could be devised in which such choice will not be the direct choice of the Western Federation of Miners, as such, and with that federation we will have no dealings of any kind.

"It cannot be too definitely understood with relation to the present situation that the mining companies cannot and will not in any manner recognize or deal with the Western Federation of Miners. They do not represent our employees, but, on the contrary, under present conditions, they stand between the employers and the employees as the only bar to a satisfactory and amicable adjustment of all existing differences.

"Because of this situation and without any lack of full appreciation of the efforts of yourself and the Department of Labour, we feel that it is necessary to say to you that we cannot accept any plan of mediation or arbitration between the mine employers and 'The mine workers on strike,' which is but another designation for the Western Federation of Miners.

"But we suggest to you, in view of the situation as above stated, and as it exists in the counties of Houghton and Keweenaw at this date, that if you should use your personal influence and the influence of the Department of Labour to induce the officials, organizers and leaders of the Western Federation of Miners to come to a full realization of the futility of any attempt to secure recognition in this district or retain a standing therein which would permit them to remain as a factor of influence among our employees or any portion thereof, and to withdraw themselves and their influence from the present situation and from the district, there would be nothing in the way of an early adjustment of any differences or grievances, if they exist, between the employers and their employees. In this way and in this way only can the present deplorable condition be remedied or adjusted.

"Since the inception of the strike it has been stated in published speeches of the officials of the Western Federation of Miners that they demanded an eight-hour day, abolition of the one-man drill, and a minimum wage of three dollars per day for all employees. No grievances of that kind were stated or submitted to the companies in any form.

"**As to the working hours**, it may be stated to you, as was stated to Judge Murphy, who was here on a similar mission in behalf of the Governor of Michigan, that for some time prior to the inception of the strike there had been under consideration by the several companies the institution of an eight-hour day for underground employees, so far as that rule could be made practicable. The present strike situation does not alter the intention of the companies in that regard. It is known to the companies that a large number of their underground employees do not want the eight-hour day, and are opposed to it, but we will state to you that if the eight-hour day for our underground employees is desired by them, or a sufficient majority of them, it will continue to be given favourable consideration.

"**The One-man Drill Question** is purely and simply a manufactured grievance. We know it to be the fact that those who operate these drills do not want them abolished. The continuation of mining industry in this district requires the use and application of every modern appliance for the reduction of cost. It is made necessary by the low copper contents of the rock and the expense of deep mining, as compared with higher production of other competing districts. The one-man drill is an economic necessity which has come to stay. The conditions of its use have been prescribed by the Legislature, and the question of its abolition is one which could not be submitted to arbitrators.

"**As to the Minimum Wage Question**, the conditions at the different mines vary to such a large extent that no scale can be adopted applicable to all the different conditions. This has been impossible in the past and will continue impossible in the future, and would be as unfair to the labourers themselves as to the companies.

"We greatly regret that the situation is such as to render the plan of arbitration or of conference with a committee or with representatives of the Western Federation of Miners an impossibility to us. With the elimination of that organization, arbitration or mediation would become wholly unnecessary, as we are convinced that there would be no difficulty in adjusting satisfactorily all questions that might arise between our employees and the respective companies by whom they are employed. Dated at Houghton, Michigan, Sept. 20, 1913."—Mining Gazette.

## PHILADELPHIA MEETING OF MINING CONGRESS.

Manufacturers of mining machinery, rescue and first-aid apparatus and safety appliances, are to be given an opportunity to display their wares before the mining men of the country at a great industrial exposition, to be held under the auspices of the American Mining Congress, in Philadelphia, Pa., the week of October 20th.

This exposition, the first of its kind in America, will be held in conjunction with the annual convention of Mining Congress, and the double attraction is expected to attract thousands of interested men. There is a tentative plan to have a gold mining camp in full operation, with a mill crushing the ore. Horticultural Hall, the biggest place of its kind in Philadelphia, situated in the heart of the city, has been engaged for the occasion.

While the plans are still in embryo, a number of the leading manufacturers have already been approached and have shown sufficient enthusiasm to lead to the belief that all of the space will be taken in a short time and that there may not be enough to take care of all who apply.

A number of the big coal companies that have developed the "Safety First" movement at their mines, are now negotiating for large amounts of space, to show the mining men and the public what they are doing in behalf of their men. These companies will send rescue and first-aid crews, and there is talk of exhibition drills between the various crews. The United States Bureau of Mines will be represented by one of its safety cars and a picked crew of helmet men. The State of Illinois and a number of the big anthracite companies, may send rescue cars for exhibition purposes.

"This exposition will not only be of untold value to the mining men of the country," said James F. Callbreath, Secretary of the Congress, "but it will also show the magnitude of the industry to the entire country. We know that it is a gigantic industry, second only to agriculture, employing directly more than a million and a half men, and with a yearly output of two billion dollars, but the public has never given it the recognition it deserves. The convention which will be held at the same time as the exposition will be the most important body of mining men ever gathered together. The industry has been making great strides in the last few years, and a number of problems have arisen that are to be discussed straight from the shoulder."

The Convention is to be the first get-together affair of all the mining interests of the country, and an attempt is to be made to show the need of a stronger national organization, that will represent all phases of the industry and lead to the placing of the industry in the important place it belongs. Perhaps the leading topic of the Convention will be the new system of mine taxation recently put in operation in some States and being discussed in others at the present time. The West can unite with the East upon this proposition, for Colorado and Arizona have new taxation laws for the mines, and so have Pennsylvania and Michigan. Colorado mining men are claiming that they are doubly taxed, and that their industry will suffer. Arizona is making similar claims, and it is understood that Michigan is very much dissatisfied. An increase in the price of Pennsylvania coal is threatened by reason of the new tax law in that State.

Altogether, the exposition and the convention promise to bring together a great gathering of mining men, and much good is expected from its deliberations.

## RAMBLER-CARIBOO.

A meeting of directors of the Rambler-Cariboo Mines, Limited, was held in Spokane, Washington, U. S.A., on September 10, when reports that had quite lately come from the company's mine manager were submitted. The president of the company, Mr. A. F. McLaine, has been quoted as authority for the statement that the company's net profits are now more than $10,000 a month, with prospects of still better results shortly. The company's silver-lead mine and concentrating mill are in the Slocan district, British Columbia. The mine has been opened to a depth of about 1,425 feet below the apex of the vein, and ore is being stoped on four or five levels down to and including that depth.

## ALBERTA COAL.

The first session of the third Alberta Legislature was opened at Edmonton, Alberta, on September 16. It is noteworthy that in the "speech from the throne," as printed in the newspapers, there was not a single word of reference to the mining industry of the province. Yet, according to statistics supplied to the Canada Department of Mines by Mr. John T. Stirling, Provincial Inspector of Mines, Alberta in 1912 produced 3,446,349 tons of coal, valued at $8,471,126.

# BOOK REVIEWS

**Introduction to the Study of Igneous Rocks**—By George Irving Finlay, Ph.D., Assistant Professor of Geology, New York University—McGraw-Hill Book Co., N.Y.—Price, $2.00, net.

The author aims in this book to select from the large body of observed facts bearing on the identification of rocks with the microscope those which it is desirable for the beginner to get command of in the course of his early studies. The work is intended as an introduction to the exhaustive treatises on the subject.

The title is somewhat misleading. The book contains no description of the mode of occurrence of igneous rocks, no discussion of their origin. Such phenomena as differentiation are not even mentioned. There is no discussion of alterations. The book might better have been designated as an introduction to the study of the microscopical characters of rocks and a quantitative classification.

The determination of the igneous rocks in hand specimens—the means actually in use by nearly all those who study rocks in the field, is dismissed in a rather cursory manner. A careful examination with the hand lens should be recommended as the most readily available means of determination of rocks, and the student should study large collections of properly labelled specimens in order to be able to make comparisons before resorting to the use of the microscope. That the author is overanxious to use thin sections for determinations is indicated by such statements in regard to lavas as this: "If we see laucite we conclude safely that the rock should be put with the phonolites, but otherwise we have no good reason for such a determination."

The chapter on movement of light in crystals is similar to that in several other texts already available.

Chapter IV., The identification of the essential minerals of igneous rocks; Chapter V., Description of the Accessory Minerals; and Chapter VI., The Igneous Rock Types, form the most interesting and original portion of the text. The distinctive characters of the rock minerals are well pointed out and helpful. Brief statements of the composition of the common rocks are given.

The last half of the book contains little material not readily available in other works, being largely a synopsis of chapters from Idding's Igneous Rocks and the Quantitative System of Classification advanced by Messrs. Cross, Iddings, Pirsson and Washington, together with methods of calculating the chemical analyses of rocks.—R. E. H.

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**General Metallurgy**—By H. O. Hofman, E.M. Met. E., Ph.D., Professor of Metallurgy in the Massachusetts Institute of Technology—McGraw-Hill Book Co.—Price, $6.00, net.

In this work the author has endeavoured to give a general introduction to the study of metallurgy. It is not a treatise on the metallurgy of copper or of iron or of lead; but a discussion of the properties of metals, alloys, metallic compounds, fuels and refractory materials, of metallurgical processes and apparatus of mechanical metallurgical operations and of metallurgical products. It has a place by itself in the literature. There is no other modern text which covers the same field.

The subject is treated from the standpoint of the metallurgist who has a leaning towards physical chemistry. The theory of solutions developed by physical chemists is applied to the study of the metals and alloys. Elementary statements of the theories are given; but the text is not greatly overloaded with information that the student may already have gathered in his study of general chemistry and physics.

Following the shorter introductory chapters on properties of metals, alloys, metallic compounds and ores is a long chapter—236 pages—on fuels. This contains a very instructive discussion of the properties of fuels and methods of determining them. The numerous types of coals and their uses, the methods of coking and of saving the by-products, liquid fuels, gases, gas production and apparatus for burning the fuels are among the numerous subjects dealt with.

Chapter VII. is devoted to refractory materials. Properties and uses of fire-clay, fire-brick, silica, barite, lime, etc., are described.

Chapters VIII., IX. and X. are devoted to pyrometallurgical, hydrometallurgical and electrometallurgical processes and apparatus. The treatment of these subjects is excellent, as an endeavour is made to elucidate principles rather than to describe special methods.

Chapter XI.—350 pages—is devoted to mechanical metallurgical operations. In view of the existence of Prof. Richards' excellent text book on this subject, there seems to be unnecessary duplication here, though recognition of the fact that mechanical methods are of constantly increasing importance to the metallurgist is obtained by treating ore dressing in the same text rather than in a separate one.

Two short chapters are devoted to metallurgical products and economic considerations.

The volume will prove a very useful one and will doubtless be adopted by many teachers who have been looking for a work which deals with metallurgical principles.—R. E. H.

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## HEDLEY GOLD.

The Hedley Gold Mining Company, operating the Nickel Plate group of mines, Similkameen district, British Columbia, recently declared its customary quarterly dividend and bonus, together 5 per cent., on the issued capital of the company, which is $1,200,000. This distribution of $60,000 makes the total of profits divided in 1913 $180,000. Last year the final distribution of the year was at the rate of 15 per cent., making a total of 30 per cent. for 1912; for December, 1911, it was 10 per cent., and the total for that year was 25 per cent. The 1913 profits are understood to have thus far been higher than in either 1912 or 1911.

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## GOLD REPORTED NEAR TELKWA, B.C.

Western papers report a new gold strike at Sibola Creek, a tributary of the Tahtsa River, 100 miles southeast of Telkwa, B.C. No official news is yet available. Telkwa is on the line of the G.T.P., and a rush of men engaged in construction work is regarded as not unlikely.

## PERSONAL AND GENERAL

Mr. H. C. Meek, general superintendent of the Dome mine, has returned to Porcupine after an absence of several months.

Mr. E. L. Bruce, who had been assisting Dr. C. W. Drysdale in local geological investigation, left Rossland, B.C., on Sept. 6 for New York City, to resume duty as an instructor in mineralogy at Columbia University.

Mr. Howard W. Du Bois, of Du Bois, Mixer & Armas, Philadelphia, Pa., was at Barkerville, Cariboo district, B.C., at the end of August.

Mr. John L. Retallack has been visiting Similkameen and Tulameen districts, British Columbia.

Mr. C. J. Seymour Baker has returned from London, England, to the Cariboo district of British Columbia, to continue experiments in extracting gold from black sand, on which problem he has been working for several years.

Mr. George L. Fraser has retired from the management of the Columbia Coal and Coke Company, which for several years has been developing a coal property near the lower Tulameen River, British Columbia.

Mr. Desaix B. Meyers, of Los Angeles, California, has been examining the Emerald lead mine, in the vicinity of Salmo, Nelson mining division, B.C.

Mr. Chas. H. Clapp, who for five or six years has done geological work on Vancouver Island, British Columbia, for the Geological Survey of Canada, has gone to Arizona to commence his new duties as Professor of Geology at the University of Arizona.

Mr. Lionel Hill, assistant to the manager for the Le Roi No. 2, Ltd., has returned to Rossland, B.C., from a visit to England.

Mr. Frederick K. Brunton, assistant superintendent at the British Columbia Copper Company's smelting works, has returned to Greenwood, Boundary district, B.C., from Butte, Montana, where he attended the meeting of the American Institute of Mining Engineers.

Mr. Donald G. Forbes, who has been investigating mining conditions in Portland Canal, Queen Charlotte Islands, and other coast districts for the British Columbia Department of Mines, is now giving attention to Valdes Island, which is one of a number of islands lying between Vancouver Island and the mainland of British Columbia.

Mr. E. R. Davidson, of Spokane, Washington, manager for the Eagle Lode Mining Company, recently let a contract for driving about 1,000 feet of tunnel on the company's Eureka group, in Ainsworth mining division, B.C.

H. W. Johns-Manville Co. has opened a new branch at Galveston, Texas. This concern owns asbestos mines at Danville, Quebec.

Prof. Francis A. Thomson, head of the mining engineering department of the State College of Washington, Pullman, Washington, last month made a long trip to the head waters of Crawford Creek, a stream emptying into Kootenay Lake, British Columbia, to examine some copper claims.

Mr. Hamlin B. Hatch has returned to South Porcupine after spending five months exploring and prospecting in the district of Patricia, Northern Ontario.

Mr. W. J. Watson, manager for the Tyee Copper Company, has returned to Ladysmith, Vancouver Island, B.C., from several months' travel in Europe and elsewhere.

Mr. Jas. Ross, president of the Dominion Coal Company, died on September 20, after an illness of two weeks.

Mr. Robt. B. Stewart has returned to Toronto from Alberta.

Dr. Waldemar Lindgren's work on Mineral Deposits is now ready.

Mr. Peter MacLaren, formerly manager of the Scottish Ontario mine, Porcupine, has returned to Tisdale Township to take charge of the property of the Success Gold Mining Company.

Mr. C. W. Wright, manager of the mining interests of Lord Brassey in Italy, who was recently in Western Canada mining districts with the Geological excursion, has returned to Italy.

Mr. Reginald E. Hore has returned from a visit to the Michigan copper mining district.

Dr. Willet G. Miller was given the honorary degree of LL.D. at a special convocation of the University of Toronto, August 14. Friends of Dr. Miller are arranging to present him with an oil portrait of himself as a mark of esteem from the mining fraternity.

The American Mining Congress meets in Philadelphia October 20 to 24.

### JAPANESE COAL BOGEY.

On September 6 "Coal Age," New York, printed as an item of news the following: "Vancouver, B.C.—Public indignation over the forced importation of Japanese coal, as the result of the refusal of the operators to arbitrate the strikes in mines near here, is liable to effect, it is said, the opening of Government mines in Alaska. The mine operators declare that they will import Japanese coal until the strikers return to work, and the owners are being bitterly denounced as responsible for this situation." Occasionally "Coal Age" is unfortunate in its selection of news items relating to British Columbia. Under the circumstances that there are not at any British Columbia port facilities for unloading coal from any sea-going vessel, nor accessible bunkers to store it in if it were unloaded, the alleged "public indignation" is somewhat superfluous. It is probable the freight rate on coal from Rocky Mountain coal fields in Canada would be less than the cost of unloading and storing Japanese coal, so the statement that mine operators threaten to import Japanese coal is only one of the wild allegations of agitators. The Western Fuel Company has arranged to get Japanese and Australian coal shipped to San Francisco to supply its customers there, but that is "a horse of another colour." In this connection it may be mentioned that the Canadian Collieries (Dunsmuir) Limited, which ever since the strike was called last September, has been working its Cumberland mines with non-union men, during the last few days of August and on toward the middle of September had got its output of coal from that colliery up to an average of fully 2,000 long tons a day. On September 8 2,290 tons was produced, and on September 10 2,287 tons, while the daily average for six working days to September 10, inclusive, was 2,014 tons. The general average when conditions were normal, before the strike, was only about 2,100 tons. Then non-union men have gone back to work in the same company's mines at Extension, where production is being resumed, although the electric locomotives having been destroyed by the strikers, the output will necessarily be comparatively small until power haulage facilities shall be restored. It is understood that the Pacific Coast Coal Mines Company intends to resume coal mining without delay at its South Wellington colliery. The Japanese coal bogey, therefore, will soon pass out of the limelight.—E. J., Victoria, B.C.

# SPECIAL CORRESPONDENCE

## COBALT, GOWGANDA, ELK LAKE AND SOUTH LORRAIN

**Draining Kerr Lake.**—Already the draining of Kerr Lake has revealed veins of ore which appear from their surface indications to be likely to reimburse the Crown Reserve Mining Company and the Kerr Lake Mining Company for their trouble. The pumps have lowered the lake more quickly than was anticipated.

Six new veins, which the underground plans do not show below, have been picked up. All these veins show some native silver. The largest of the new veins was found on a point of rock about 150 feet straight north of the old No. 1 shaft. The vein has been traced for 50 feet and runs from two to four inches of two thousand ounce ore. This strike is almost due east and west, and is supposed to be one of the Fleming series. Another series of small veins, three in number, were found just west of the pipe line. The largest of these, nearest the shore, is two inches, and can be traced for several hundred feet in places, showing as a mere crack in the rock. Fifteen feet south is another vein, quite narrow, but traced for some distance, while eight feet further is the third of the series. These veins are immediately north of No. 9 shaft. Further to the west are two other veins, running from mere cracks to two inches in width. Plans will immediately be made to cross-cut these veins from levels that are already being worked under the lake. Until these new ore bodies are more carefully surveyed, it cannot be said with certainty that they are not being worked below, but with the data at present available it does not appear probable. All these leads have excellent possibilities.

It has been found necessary already to move the scow upon which the pumps are placed further into the lake, as the waters are receding much more rapidly than it was at first thought would be the case. The water level has been already lowered sixteen feet, and, as a result, the bay at the Crown Reserve end of the sheet of water is bare. Now one pump has been laid off in order that hydraulicking operations in sluieing off the mud at the bottom may be commenced. The Crown Reserve will sluice off the thick covering of mud which overlays the conglomerate formation, but will not trouble to lay bare the diabase for some time.

**Beaver.**—The quarterly report of the Beaver Consolidated mine shows that the net balance on Aug. 31 was $127,910. A vein, which has been worked with advantage on the 450 foot level, has recently been cut at the 500 foot level, and shows there four or five inches of high grade ore. On the 530 foot level, 52 feet from the No. 3 vein, a new vein was cut two inches wide, of 1,900 ounce ore, and on a branch of the same level is also yielding good ore. On the 460 foot level there is a shoot of ore on the main vein for 400 feet in the drift, and it is holding good in both faces. Other developments are satisfactory. But the main development for the Beaver Company is at the Beaver Auxiliary at Elk Lake, the property they took up under option last year. In the south drift on the vein some remarkably high grade ore is now showing. When the vein was first cut 60 feet east from the new shaft the values were not at all promising, running only a few hundred ounces. But now a rich ore shoot is being worked in the south face, the values running five or six thousand ounces over the width of two and a half to three inches. There is no pay ore in the north face yet. Another interesting vein was cut; but it has not been drifted upon yet. There are still three payments of $5,000 to be made on the property.

**The Lumsden Mining Company**, South Coleman, announces the interesting fact that at the 250 foot level the vein they were drifting upon in the Keewatin also holds good across the contact in the diabase. There have been some very rich but quite short shoots of ore on this vein, but the ore in the diabase runs higher than any previously encountered.

**Bullion Shipments.**—An announced rise of $2.50 per hundred pounds express on silver bullion shipped to London has induced the Nipissing to consign their shipments to New York. The steamship companies state that they have been getting little or nothing out of the freight and intend to raise the price of oversea shipment at the end of the month. If no compromise is arrived at, nearly all the bullion will go to New York, as the slightly better rate allowed by the London brokers will not counterbalance the increase in the express rate. The Nipissing at first did ship all their bullion to New York, as did the Buffalo mine, but they afterwards found it to their advantage to make London their market.

**South Lorrain.**—While the shutting down of the Wettlaufer in a month or six weeks deprives South Lorrain of its only consistent shipper, the good luck experienced at the old Keeley and the Curry has caused a little revival of interest in that outlying silver section. In the Wettlaufer mine the fifth and lower levels are already flooded, and in a month's time the water will be allowed to rise to the 200 foot. Before the winter actually sets in the mine will be closed down tight. While recent reports have been quite pessimistic as to this property, there is a feeling among mining engineers acquainted with the property that the possibilities of the mine have not yet been exhausted.

On the other hand, forty feet of high grade has been opened up on the new strike at the Keeley mine, now being worked by the Associated Gold Mines of Western Australia, of which Dr. Bell is the representative in Canada. This is their first entry into the Northern Ontario field.

The Curry claim, which is being worked by the Pittsburg syndicate, is mining good ore on two levels. Other properties working are the Maidens and the Proudfoot fraction, upon which the late Dr. Beattie Nesbitt once had an option. This latter property is being diamond drilled. The Bellellen has just closed down.

**McKinley-Darragh-Savage.**—The production from the McKinley-Darragh-Savage for the month of August amounted to 212,098 ounces, which is a slight decrease in comparison with the month of July. But the quarter ending in August has been so productive that the McKinley could easily have maintained the old rate of dividend. However, the management does not count on a recurrence of the good fortune in the striking of unexpected high grade ore shoots.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Hollinger Gold Mines, Ltd.**, is adding twenty more stamps to the mill, making sixty in all. Ground has already been broken. It is understood that the addition is in part intended to accommodate ore from the Dixon property, which the Hollinger Gold Mines is now working.

The gross output for the four weeks ending August 12 amounted to $141,732, and the surplus to $625,202, after paying all dividends, which have just passed the million dollar mark. The approximate average value of all ore hoisted was $18.37 per ton. Based upon the total tonnage of ore and waste hoisted the cost per ton was $2,398.

The principal development underground was the cutting of the main vein at the 425 foot level. It there shows a width of ten feet and a value of $18 a ton. Mr. P. A. Robbins, general manager, reports: "We now have a total of 16 headings advancing in ore, four upon the 100 foot level, seven upon the 200 foot level, 3 upon the 300 foot level, and two upon the 425 foot level. Besides this we are doing a considerable amount of cross-cutting, and during the week have picked up No. 5 vein at the 100 foot level; No. 8 vein on the 200 foot level, and No. 34 vein on the 300 foot level. Thirty-seven drills are working double shift."

**Hughes Porcupine.**—A change is announced in the management of the Hughes Porcupine property in Whitney township. Mr. York has left that company to take charge of the Mine d' Or Huronia in Gauthier township, near Larder Lake. This company has a plant working and a small ten stamp mill on the ground. It will be set up and be operating before the snow flies.

**Bureau of Mines Survey.**—Mr. A. G. Burrows, of the Ontario Geological Survey, and his assistant, Mr. Percy Hopkins, are again in the field studying the country in the vicinity of Sesikinik Lake. This is an extension of the Kirkland Lake field, of which Mr. Burrows made an exhaustive study this summer. The map which is to be issued by the department of the Kirkland Lake area is eagerly awaited.

**The Swastika Mine** has closed down. After doing pioneer work in this particular section of the country for years, the Swastika blossomed out as a full grown mine about two years ago. Mr. Frank Armstrong took an option upon a considerable block of the stock and spent considerable money in developing the mine. There was a good ore shoot on the 200 foot level and above, but below that level exploration has failed to disclose pay ore. The ten stamp mill has not been in operation more than a year. The grade of ore being put through, together with the low extraction possible with simple amalgamation, did not pay current expenses, and so the premier mine of the Swastika section is closed down. The Lucky Cross mine and mill are also both silent. Swastika is now devoid of all activity. Kirkland Lake is, however, quite active.

**Teck-Hughes.**—The Teck-Hughes is doing extensive work at Kirkland Lake, both in sinking and drifting. The No. 1 shaft is now down 226 feet, the veing being in porphyry. From the No. 2 vein, at the 100 foot level, a vein has been cut showing some free gold.

**Wright-Hargraves.** — On the Wright-Hargraves, which is under option to Mr. Cartwright and his associates, ore is being sacked. Sixty bags have been taken off and will be shipped when a full carload is obtained. Most of this has been obtained from the No. 1 vein, which is 350 feet east of the old discovery. An incline shaft is now being sunk and is down about forty feet and a steam plant is in operation.

**Power for the Kirkland Lake Mines.**—Power is one of the prime needs of the Kirkland Lake camp. Tentative offers have been made to the Gold Fields, Limited, for the purchase of their power at Raven Falls, and there is a scheme afoot to increase the capacity of the plant owned by Mr. Pete Farah at Charlton and to run a transmission line from that point.

**Kert.**—The Hon. David Mitford, of London, has taken up the other half interest in the Kert claim in Teck township. Extensive trenching and stripping has been carried out on the property.

**Tough-Oakes.**—It is probable that for the present the Foster-Tough-Oakes Company will be content to mine with their present mill equipment. Good results are being obtained in the drift on the vein at the 100 foot level. The high grade streak is 25 inches wide and ore which will be hand picked for shipment to the smelter is being broken for a width of two feet. Ore is already being bagged for the next carload shipment. The ten stamp mill is only making an extraction of about 57 per cent. of the ore from the dump; but it is paying current expenses at the mine.

**General View of Plant, Swastika Mine, Ont.**

## BRITISH COLUMBIA

### CARIBOO.

**Barkerville.**—Drilling, to test the gold-bearing gravel, has been commenced at the Meadows, below the old Kurtz and Lane shaft, on Williams Creek, Cariboo, by a New York syndicate, the object being to ascertain the suitability or otherwise of the ground for gold-dredging. A Keystone drill, steam-driven, is being used in making the tests.

**Quesnel.**—Announcement has been received of the intention of the Provincial Labour Commission to hold sittings in Cariboo district during September. The dates are: Tete Jaune Cache, 9th; Fort George, 12th, and between 13th and 25th Barkerville, Quesnel, 150-Mile House, Clinton, Lillooet and Ashcroft.

Mr. A. Stewart, resident engineer at Quesnel for the Public Works Department, has arranged to make a tour of inspection of the route of the proposed wagon road between Barkerville and Fraser River—from Bear Lake through to Fraser River, via Goat River.

## EAST KOOTENAY.

**Fernie.**—On August 17 a train consisting of 101 cars of coal and hauled by one locomotive (a Mallet compound), left the Great Northern Railway Company's yards at Fernie, Crow's Nest Pass.

On August 19 the members of the International Geological Congress Excursion C2 were entertained at a smoker at Fernie. In the course of a short address made by Mr. W. R. Wilson, general manager for the Crow's Nest Pass Coal Company, by request of the visitors, that gentleman said that in no mining region where he had been was the science of geology more necessary to the successful prosecution of coal mining than right there in the Crow's Nest Pass, where conditions of the most extraordinary character made the mining of coal from the earth a business on which must be brought to bear every aid that science, skill and experience could afford.

## SLOCAN.

**Silverton.**—Shipments of silver-lead ore and concentrate to Trail by the Standard Silver-Lead Mining Company during August totalled about 1,100 tons. This included some 200 tons of crude ore and 900 tons of concentrate. The zinc concentrate made at the company's mill has been stored latterly; of this product from 500 to 600 tons is made monthly, with the mill running only one shift. This is in addition to the silver-lead concentrate, which is shipped regularly, as far as transportation arrangements conveniently admit. The output of ore from the Standard mine is chiefly from stopes between levels Nos. 6 and 5 and Nos. 5 and 4. The ore body being mined in the latter gives from 7 to 8 feet of clean ore, beside much mill feed ore. The lower stopes, between 6 and 5, also yield considerable ore. No. 7 adit, being driven at a vertical depth of about 300 feet below No. 6, is now in more than 1,400 feet, with 400 feet more to be driven before the face will be under the portal of No. 6. One shoot of ore has been cut by No. 7—lead ore with some zinc—but this working will have to be advanced to about 3,800 feet from the portal before it will be vertically under the ore body being mined between 6 and 5. Preparations are being made to extend No. 8, which is 750 feet vertically below No. 6; the old adit is being retimbered before resuming driving.

## TRAIL CREEK DIVISION.

**Trail.**—Ore receipts at the Consolidated Mining and Smelting Sompany's works at Trail during four weeks ended August 28 were as under.

| From. | Tons. |
|---|---|
| East Kootenay— | |
| St. Eugene | 145 |
| Sullivan | 2,607 |
| | 2,752 |
| Ainsworth— | |
| Bluebell | 463 |
| Maestro | 157 |
| No. 1 | 233 |
| Retallack & Co. | 118 |
| Silver Hoard | 96 |
| Utica | 63 |
| | 1,130 |
| Slocan— | |
| Eastmont | 29 |
| Idaho-Alamo | 87 |
| Noble Five | 22 |
| Rambler-Cariboo | 262 |
| Richmond-Eureka | 31 |
| Slocan Star | 79 |
| Standard | 989 |
| | 1,499 |
| Nelson— | |
| Emerald | 142 |
| Silver King | 369 |
| Yankee Girl | 480 |
| | 991 |
| Rossland— | |
| Centre Star | 11,539 |
| Giant-California | 31 |
| Inland Empire | 25 |
| Josie (Le Roi No. 2) | 1,706 |
| Le Roi | 4,042 |
| | 17,343 |
| Lardeau— | |
| Ajax | 88 |
| Ferguson | 22 |
| | 110 |
| Boundary— | |
| No. 7 | 59 |
| District not specified— | |
| Bonanza | 94 |
| Golden Zone | 22 |
| Pittsburg | 14 |
| | 130 |
| Republic (U.S.A.)— | |
| Belcher | 355 |
| Ben Hur | 1,206 |
| Knob Hill | 150 |
| | 1,711 |
| Total | 25,725 |

## BOUNDARY.

**Grand Forks.**—Figures published locally show the Granby Consolidated Company's production of blister copper in 1913, to the end of August, to have been 14,492,997 pounds from 829,979 tons of ore, of which 820,240 tons was from the company's own mines at Phoenix and 8,830 tons custom ore. Largest monthly quantities were those of March, when the quantity of blister copper produced was shown as 2,020,000 pounds, and of ore treated 108,871 tons—107,931 tons from Granby Company's mines and 940 tons of custom ore. August figures are: Blister copper produced, 1,827,300, from 101,722 tons of ore—99,641 tons from Granby Company's mines and 2,081 tons of custom ore.

Shipment of ore from the Union group of mineral claims in Franklin camp, north fork of Kettle River, has been commenced. It is stated that more than 100 tons of ore of shipping grade is on the dump and being sacked for hauling to the present terminus of the Kettle Valley Railway, about 18 miles from Grand Forks. The ore has to be hauled in wagons 28 miles to the railway, whence it is taken to the Granby Company's smelting works. Cost of hauling to railway is given as $15 a ton, and railway freight and treatment charges as $6. Value is in silver and gold. No ore had been sent out in bulk previously, from Franklin camp claims.

### YALE.

**Hope.**—The size of the ore body lately opened in the Aufeas mine, on Wardle Creek, has not yet been determined. So far a width of 26 feet of ore has been proved, but no wall has yet been found. The ore is arsenopyrite, with a little chalcopyrite, and gold is the principal valuable metal it contains.

The old Murphy property, situated on the north side of Fraser River, about one mile above Hope Railway station, has been bonded by A. Beamer and A. E. Raab, of Hope. The original mineral claim was located and development was done on it in the early sixties; later several other claims were located, and now the whole group is under bond. An 800 foot adit, driven long ago, has been cleaned out, and is being extended to connect with an old shaft. The ore is gold-copper of good grade.

### COAST DISTRICT.

**Vancouver.**—A news item published in the Vancouver Daily Province read as follows: "Compromise has been successful in ending the strike at Britannia mines, Howe Sound, which has been in progress since February last, and which affected some 600 men. As a result of negotiations, which have extended over some weeks, notice is given that at a meeting of the local members of Britannia Miners' Union, held on August 27, the strike has been declared off. Notice of this action has been sent to all parties interested."

Shortly afterward the vice-president and general manager of the Britannia Mining and Smelting Company caused the following to be published in Vancouver: "There has appeared in the various papers published in Vancouver a notice that the strike at Britannia mines had been declared off, a compromise having been arranged with this company. So far as this company is concerned, we desire to state that no compromise of the strike has been arranged by nor on behalf of the company, and so far as the company is concerned the conditions are the same as they were in February of this year."

It may be added that in February less than one-half of the 700 men then employed by the company (that being the full number then on the company's pay roll and including Japanese and Chinese labourers employed in railway grading and other surface work, and some 50 white carpenters engaged in erection of buildings), went out on strike at the behest of the local officials of the Western Federation of Miners. Within six weeks the places of miners, shovellers, trammers and other underground men who had struck, were filled, and ever since Easter the company has been turning away men seeking work at its property. Not one of those who struck work has been re-employed, all having been warned when they responded to the call of the Union that it would be useless for them to seek work at the Britannia again, since it would not be given them. The management emphatically denies having made any compromise with or concession to the strikers, nor does it intend to. Its mines are now operated by non-union labour entirely. It is noteworthy that the output of ore for eight months of 1913, to September 1, was approximately 132,000 tons, that quantity having been 11,300 tons greater than for the corresponding period of 1912. The local Union officials blundered badly in calling a strike, and the Britannia members have had to pay the penalty. They were employed by a company financially strong, with years of work ahead of it; they were being paid at the highest rate of wages obtaining at the copper mines of the province; the food supplied to them was the best obtainable, and the bunkhouse accommodation generally better than at most mines; while in provision for recreation, in hospital accommodation and medical attention, and in other matters, the company had done all that reasonable men could expect of it. The chief result of the attempt of Union officials (who over-rated their power to deal as they pleased with the Britannia Company to coerce the company) has been to bring about the establishment of a strong non-union camp at the largest productive metal mine in the Coast district, and this the men who responded to the strike call now realize.

**Nanaimo.**—The Western Fuel Company and the Pacific Coast Coal Mines Company have not conceded the demands of the officials of the United Mine Workers of America, nor have they yet resumed work. A number of fire bosses and others are keeping things in shape at the Western Fuel Company's mines, but the company's headquarters at San Francisco having made arrangements to get from Australia and Japan all the coal it will require to supply its customers in that city, and having as well chartered two vessels to take coal from Puget Sound, Washington, to San Francisco if needed, there is no immediate need for it to attempt to operate its mines here. It is understood the Pacific Coast Coal Mines Company will shortly endeavour to operate its mines at South Wellington. The Canadian Collieries (Dunsmuir), Limited, is resuming work at its Extension colliery; the output of the mines at its Cumberland colliery has latterly averaged more than 2,000 tons of coal a day, which is within one or two hundred tons of the average when things were normal before the labour trouble arose.

### PORTLAND CANAL.

**Stewart.**—By the middle of September the low level adit being driven by the Portland Canal Tunnels, Ltd., within four miles of the town of Stewart, at the head of Portland Canal, had reached a distance from its portal of about 2,000 feet. Assuming that what appears to be the main vein of the fissure zone of the Portland Canal Mining Company's group of mineral claims continues to depth, the calculation made before the work of driving the adit was undertaken was that a distance of 2,300 feet would have to be driven to reach the vein, on its dip, at 620 feet below the surface working known as the Richard cut. On August 25 a 5-inch veinlet of quartz was cut by the adit; the quartz contained a fair proportion of pyrite and a very little galena. On August 28 the face of the adit was in a larger vein of white quartz containing pyrite, and crossing the adit diagonally. This vein has since been proved to be 11 feet 6 inches wide and to be fairly well mineralized with pyrrhotite. The manager reports that while he does not expect the ore from this vein to assay more than a dollar or two, the really interesting question is what will be found at the junction of this vein with the main vein to cut which the adit is being driven. The point of junction is calculated to be about 150 feet south of where, assuming projections to be correct, the adit will enter the main vein.

# STATISTICS AND RETURNS

## COBALT ORE SHIPMENTS.

The ore shipments for the week ending Sept. 20 were:

| | High. | Low. | Tons. |
|---|---|---|---|
| McKinley-Darragh | 1 | .. | 28.15 |
| Miscellaneous | 1 | .. | 45.65 |
| Hudson Bay | 2 | .. | 61.67 |
| Nipissing | .. | 2 | 63.26 |
| O'Brien Mine | 1 | .. | 31.21 |
| Cobalt Lake | 1 | .. | 31.80 |
| Beaver | 1 | .. | 31.82 |
| | 7 | 2 | 193.56 |

The bullion shipments for the wek are:

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 101 | 121,815.25 | $72,817 |
| Buffalo | 65 | 66,680.00 | 40,500 |
| Crown Reserve | 45 | 48,790.00 | 29,268 |
| | 211 | 237,285.25 | $142,585 |

The bullion shipments for the year to Sept. 20 are:

| Mine | Ounces. | Value. |
|---|---|---|
| Nipissing | 4,329,276.11 | $2,407,017.42 |
| Penn-Can. | 14,141.60 | 8,456.90 |
| Buffalo | 1,191,941.90 | 742,301.57 |
| Crown Reserve | 364,056.00 | 222,877.25 |
| Dom. Red. | 352,183.40 | 203,277.15 |
| Townsite | 36,818.40 | 30,364.04 |
| Miscellaneous | 3,920.00 | 1,623.00 |
| Timiskaming | 25,561.70 | 14,948.04 |
| O'Brien | 118,309.77 | 61,998.66 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 13,529.83 | 8,282.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 67,817.79 | 40,873.48 |
| Bailey | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| Lumsden | 1,814.40 | 1,079.00 |
| | 6,556,403.61 | $3,860,935.51 |

## MINERAL PRODUCTION OF THE PROVINCE OF QUEBEC DURING 1912

| Substances. | No. of Workmen. | Salaries. | Quantities. | Value. | Value in 1911. |
|---|---|---|---|---|---|
| Asbestos, tons | 2,910 | $1,377,444 | 111,175 | $3,059,084 | 3,026,306 |
| Asbestic, tons | .... | ...... | 25,471 | 23,358 | 19,802 |
| Copper and sulphur ore, tons | 205 | 112,215 | 62,107 | 631,963 | 240,097 |
| Gold, oz. | .... | ...... | 26,526 | 14,591 | 11,500 |
| Silver, oz. | 30 | 14,989 | 980 | 19,924 | 11,800 |
| Bog iron ore, tons | .... | ...... | ...... | ...... | 4,041 |
| Ochre, tons | .... | ...... | ...... | ...... | 2,469 |
| Chromite, tons | 53 | 13,374 | 7,054 | 32,010 | 28,174 |
| Mica, lbs. | 109 | 51,820 | 499,981 | 99,463 | 76,428 |
| Phosphate, tons | 5 | 2,000 | 164 | 1,640 | 5,832 |
| Graphite, tons | 156 | 45,209 | 1,210,278 | 50,680 | 33,613 |
| Mineral water, gals. | 17 | 3,345 | 99,452 | 39,854 | 65,648 |
| Titaniferous ores, tons | 16 | 3,720 | 1,127 | 4,024 | 5,684 |
| Slate, squares | 25 | ...... | 1,894 | 8,939 | 8,248 |
| Cement, bbls. | 1,063 | 926,064 | 2,684,002 | 3,098,350 | 1,931,183 |
| Magnesite, tons | 5 | 800 | 1,714 | 9,645 | 6.416 |
| Marble | 282 | 141,832 | ...... | 252,041 | 143,451 |
| Flagstone | 4 | 550 | | 600 | 500 |
| Granite | 637 | 268,762 | ...... | 358,749 | 308,545 |
| Lime, bush. | 294 | 130,759 | 1,705,937 | 455,570 | 284,334 |
| Limestone | 1,547 | 768,562 | ...... | 1,363,555 | 1,128,402 |
| Bricks, M. | 1,443 | 483,509 | 154,546 | 1,284,232 | 1,129,480 |
| Tiles, drain and sewer pipe, pottery, etc. | 154 | 67,750 | ...... | 203,100 | 142,223 |
| Quartz | .... | ...... | ...... | ...... | 1,125 |
| Kaolin | 67 | 15,256 | 40 | 520 | ...... |
| Feldspar | 5 | 2,000 | 110 | 2,200 | 600 |
| Peat | 10 | ...... | 500 | 2,000 | 700 |
| Sand | 99 | 20,222 | ...... | 170,600 | 62,000 |
| Glass sand | .... | ...... | ...... | ...... | 1,179 |
| Phonolith, tons | 4 | 228 | 170 | 418 | ...... |
| Totals | 9,140 | $4,450,410 | | $11,187,110 | $8,679,786 |

## STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.) Sept. 24, 1913.

| | Bid. | Asked. |
|---|---|---|
| Alaska Gold | 21.50 | 22.00 |
| British Copper | 1.75 | 2.00 |
| Braden Copper | 7.62½ | 7.75 |
| California Oil | 191.00 | 193.00 |
| Chino Copper | 41.50 | 41.75 |
| Giroux Copper | 1.25 | 1.75 |
| Green Can. | 6.75 | 7.00 |
| Miami Copper | 22.75 | 23.25 |
| Nevada Copper | 16.75 | 17.00 |
| Ohio Copper | .50 | .62½ |
| Ray Cons. Copper | 19.50 | 19.75 |
| Standard Oil of N. Y. | 152.00 | 154.00 |
| Standard Oil of N. J. | 371.00 | 373.00 |
| Standard Oil (old) | 1135.00 | ...... |
| Standard Oil (subs.) | 735.00 | ...... |
| Tonopah Mining | 4.75 | 4.87½ |
| Tonopah Belmont | 7.06¼ | 7.12½ |
| Tonopah Merger | .68 | .70 |
| Inspiration Copper | 16.00 | 16.50 |
| Goldfield Cons. | 1.87½ | 2.00 |
| Yukon Gold | 2.25 | 2.37½ |

### Cobalt Stocks.

| | | |
|---|---|---|
| Bailey | .05½ | .06 |
| Beaver | .34 | .34½ |
| Buffalo | 2.10 | 2.40 |
| Canadian | .19 | .22 |
| Chambers Ferland | .13 | .14 |
| City of Cobalt | .25 | .40 |
| Cobalt Lake | .40 | .45 |
| Coniagas | 7.20 | 7.40 |
| Crown Reserve | 1.62 | 1.65 |
| Foster | .02 | .04 |
| Gifford | .01 | .03 |
| Gould | .03¼ | .03½ |
| Great Northern | .13 | .13½ |
| Hargraves | .02 | .03 |
| Hudson Bay | 75.00 | 80.00 |
| Kerr Lake | 4.10 | 4.25 |
| La Rose | 2.25 | 2.28 |
| McKinley | 1.50 | 1.54 |
| Nipissing | 8.75 | 8.85 |
| Peterson Lake | .27¼ | .27½ |
| Right of Way | .04½ | .05 |
| Rochester | .02 | .03 |
| Leaf | .02 | .02½ |
| Cochrane | .40 | .50 |
| Silver Queen | .02½ | .04 |
| Timiskaming | .24 | .25 |
| Trethewey | .30 | .35 |
| Wettlaufer | .14 | .15 |
| Seneca Superior | 2.40 | 2.70 |

### Porcupine Stocks.

| | | |
|---|---|---|
| Apex | .00½ | .01 |
| Crown Chartered | .00⅜ | .00½ |
| Dome Extension | .04⅞ | .05½ |
| Dome Lake | .20 | .21 |
| Dome Mines | 11.50 | 14.00 |
| Foley O'Brien | .20 | .23 |
| Hollinger | 16.85 | 17.30 |
| Jupiter | .15 | 15½ |
| McIntyre | 2.10 | 2.50 |
| Moneta | .03 | .06 |
| North Dome | ... | .45 |
| Northern Exploration | .25 | 1.00 |
| Pearl Lake | .31½ | .32 |
| Plenaurum | .50 | .80 |
| Porcupine Gold | .08¼ | .09 |
| Imperial | .01⅛ | .02 |
| Porc. Reserve | ... | .14 |
| Preston East Dome | .01½ | .02 |
| Rea | .12 | .18 |
| Swastika | .03⅛ | .03¼ |
| West Dome | .10 | .15 |

### Sundry.

| | | |
|---|---|---|
| American Marconi | 4.87½ | 5.00 |
| Canadian Marconi | 2.00 | 3.00 |
| Porcupine Crown | 1.20 | 1.25 |

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## TORONTO MARKETS.

Sept. 24—(Quotations from Canada Metal Co., Toronto).
Spelter, 5 cents per pound.
Lead, 5.75 cents per pound.
Tin, 45 cents per pound.
Antimony, 9½ cents per pound.
Copper, casting, 17½ cents per pound.
Electrolytic, 17½ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Sept. 24.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).

Sept. 24.—(Quotations from Elias Rogers Co., Ltd., Toronto).
Coal, anthracite, $7.75 per ton.
Coal, bituminous, lump, $5.00 per ton.

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## GENERAL MARKETS.

### Coke.

Sept. 22.—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $2.90 to $3.00 per ton.

Sept. 22.—Tin straits, 41.85 cents.
Copper, Prime Lake, 16.75 cents.
Electrolytic Copper, 16.50 to 16.62½ cents.
Copper wire, 17.75 to 18.00 cents.
Lead, 4.75 to 4.80 cents.
Spelter, 5.75 to 5.80 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 8.30 cents.
Aluminum, 21.50 to 22.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $44.50 to $45.00 per ounce.
Platinum, hard, $50.00 to $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $39.00 per 75-lb. flask.

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## SILVER PRICES.

| | New York. cents. | London. pence. |
|---|---|---|
| Sept. 11 | 60⅛ | 27¾ |
| " 12 | 60⅛ | 27¾ |
| " 13 | 60⅛ | 27¾ |
| " 15 | 60⅛ | 27¾ |
| " 16 | 60¼ | 27 13/16 |
| " 17 | 60½ | 27 15/16 |
| " 18 | 61 | 28 3/16 |
| " 19 | 61½ | 28⅜ |
| " 20 | 61⅜ | 28 5/16 |
| " 22 | 62⅛ | 28 11/16 |
| " 23. | 61⅞ | 28 9/16 |
| " 24. | 61⅝ | 28 7/16 |

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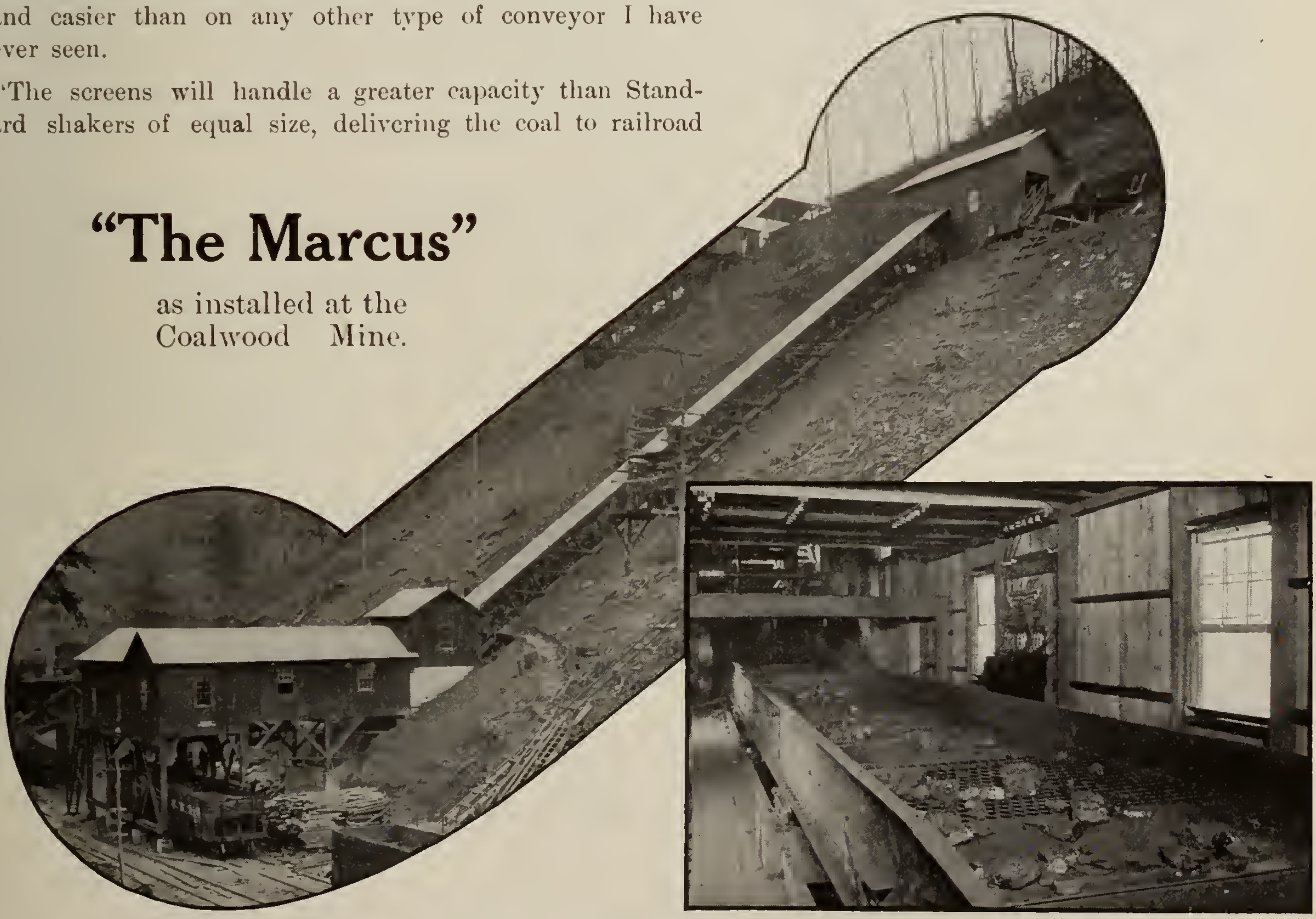

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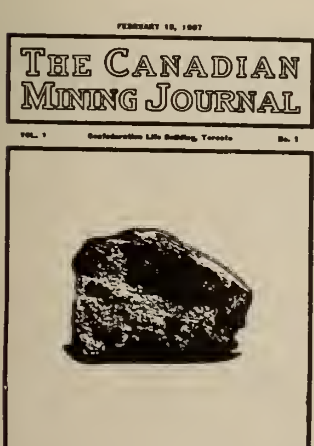


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A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

QUEBEC

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

ONTARIO

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.
1242. Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.
1220. Memoir 29. Oil and gas prospects of the Northwest Provinces of Canada, by Wyatt Malcolm. Map not yet published.

BRITISH COLUMBIA

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON AND NORTH WEST TERRITORIES

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

CANADA

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.
1277. Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

NOVA SCOTIA

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.
1208. Map 53A. Southeast Nova Scotia. Scale 4 miles to 1 inch.

NEW BRUNSWICK

1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

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1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

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750. Grenville Sheet. Parts of Counties of Ottawa, Argenteuil, Terrebonne, Two Mountains and Vaudreuil, Quebec and Carleton, Russell, Prescott and Glengarry, Ontario. Geology. Scale 4 miles to 1 inch. Reprint.
1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.
1244. Map 64A. Advance geological copy of map of Gowganda Mining Division and vicinity. Scale 1 mile to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

1260-1276. Maps 74A-90A. Geology of the Forty-ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.
1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch. feet

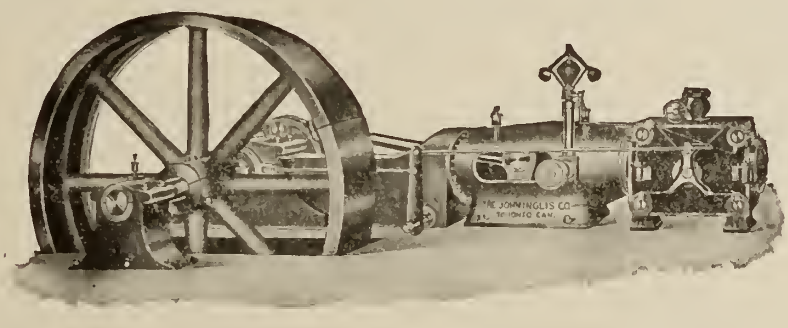
YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

***Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.***



# BUYERS AND SELLERS OF METALS

# ALPHABETICAL INDEX TO ADVERTISERS

# The Canadian Miner's Buying Directory.

**Amalgamations—**
Canadian Allis-Chalmers, Ltd
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany
Northern Canada Supply Co.

**Assayers and Chemists—**
Milton L. Hersey Co., Ltd.
Campbell & Deyell, Cobalt, Ont.
Ledoux & Co., 99 John St., New York.
Thos. Hayes & Son, 124 onge St., Toronto.

**Assayers' and Chemists' Supplies—**
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical Co.

**Ball Mills—**
Canadian Alis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock BrotherYs.
Mussens, Limited.
Krupp, Fried. A. G., Germany
The John Inglis Co., Ltd.

**Beams—Steel—**
Canadian Allis-Chalmers, Ltd
Dominion Bridge Co.
Krupp, Fried.A. G., Germany.
Mussens, Limited.

**Belting—**
Canadian Allis-Chalmers, Ltd
Mussens, Limited.
Northern Canada Supply Co.
Jones &G lassco.
Canadian Fairbank- s Moore Co., Ltd.
Federal Engineers Co., Ltd.

**Blasting Batteries and Supplies—**
Canadian Allis-Chalmers, Ltd.
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Mussens, Limited.
Northern Canada Supply Co.

**Blowers—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried.A. G., Germany.
Mussens, Limited.
Northern Canada Supply Co.

**Boilers—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Canadian Fairbanks - Morse Co., Ltd.
Mussens, Limited.
Peacock Brothers.
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
The John Inglis Co., Ltd.

**Buckets—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers. .
M. Beatty &Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.
Northern Canada Supply Co.

**Buildings—Steel Frame—**
Dominion Bridge Co.
Canadian Allis-Chalmers, Ltd.

**Cable — Aerial and Underground—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Cableways—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

**Cages—**
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.
Northern Canada Supply Co.

**Cables—Wire—**
Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
Jeffrey Mfg. Co.
Orienstein-Arthur Koppel Co.
Mussens, Ltd.
Northern Canada Supply Co.
Jenckes Bros.
Orienstein-Arthur Koppel Co.

**Cement Machinery—**
Canadian Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Northern Canada Supply Co.
Peacock Brothers.

**Chains—**
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
Northern Canada Supply Co.

**Chemists—**
Canadian Laboratories.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Ledoux & Co.

**Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

**Coal Cutters—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.

**Coal Mining Explosives—**
Curtis & Hersey.

**Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.
Roberts & Schaefer Co.

**Coal Punchers—**
Sulivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.
Roberts & Schaefer Co.

**Compressors—Air—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Canadian Allis-Chalmers, Ltd.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Brothers.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Concentrators and Jigs.**
Canadian Allis-Chalmers, Ltd.
Diester Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Canadian Allis-Chalmers, Ltd.
James Ore Concentrator Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
Canadian Allis-Chalmers, Ltd.
Peacocks Brothers.
Mussens, Limited.
Northern Canada Supply Co.

**Condensers—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Converters—**
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.

**Conveyors—Belt—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Waterous Engine Works.
Canadian aFirbanks-Morse Co., Ltd.

**Cranes—**
SmartTurner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbanks-Morse Co., Ltd.
M. Beatty & Sons, Ltd.
Krupp, Fried. A. G., Germany.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Jenckes Machine Co.
Peacock Brothers.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Roessler & Hass lacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**
Canadian Allis-Chalmers, Ltd.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Northern Canada Supply Co.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Standard Diamond Drill Co.

**Drills—Diamond.**
American Diamond Rock Drills.
Sulivan Machinery Co.
Northern Canada Supply Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.

**Drills—Electric—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dump Cars—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Mussens, Limited.
Orenstein-Arthur Koppel Co.

**Dynamite—**
Curtis & Hersey (Canada), Limited.
Canadian Explosives.
Northern Canada Supply Co.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
iSemens Co. of Canada, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Elevators—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Krupp, Fried. A. G., Germany.
M. Beatty & Sons.
Sullivan Machinery Co.
John McDougall Caledonian Iron Works.
Northern Canada Supply Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.

**Engineering Instruments—**
C. L. Berger & Sons.
Peacock Brothers.

**Engineers and Contractors—**
Fraser && Chalmers, Ltd.
Krupp, Fried., A. G., Germany.
Roberts & Schaefer Co.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
Waterous Engine Works Co.
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
M. aeBtty & Sons.
Canadian Westinghouse.
John Inglis & Co., Ltd.
Can. Fairbanks-Morse Co.

**Engine—Haulage—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
E. Leonard & Sons.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
The John Englis Co., Ltd.
Can. Fairbanks-Morse Co.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Brothers.
Can. Fairbanks-Morse Co.

**Engines—Steam—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Smart-Turner Mahine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

**Engines—Traction—**
E. Leonard & Sons.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.

**Fans—Ventilating—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.

**Feeders—Ore—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Mussens, Limited.

**Filters—**
Krupp, Fried, A. G., Germany.

**Forges—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co. Ltd.

**Forgings—**
M. Beatty & Sons.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Furnaces—Assay—**
Krupp, Fried, A. G., Germany.
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Hersey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Northen Canada Cupply Co.

**Gears—**
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Krupp, Fried, A. G., Germany.
Smart-Turner Machine Co.
Northern Canada Suply Co.
The John Inglis Co., Ltd.

**Generators—**
Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada., Ltd.

**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghiouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.
**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.
**Hoists—Air, Electric and Steam—**
Ca. Ingersoll-Rand Co. Led.
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty && Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.
**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.
**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.
**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.
**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.
**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.
**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.
**Locomotives—Compressed Air—**
Mussens, Limited.
Canadian Westinghouse.
**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.
**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.
**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.
**Monel Metal—**
Orford Copper Co.
**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.
**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.
**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.
**Ores and Metals—Buyers and Sellers of—**
eGo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.
**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser && Chalmers, Ltd.
Northern Canada Supply Co.
**Pick Machines—**
Sullivan Machinery Co.
**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.
**Pipes—Rivetted—**
Consolidated Mining & Smelting Co.
Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.
**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.
**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.
**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.
**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.
**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Small-Turner Machine Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
**Pumps—Centrifugal—**
Canadian Allis-Chalmers, Ltd.
Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
**Pumps—Pneumotic—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rrand Co.
**Pumps—Rotary—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
**Pumps—Sinking—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Can. Ingersoll-Rand Co.
**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.
**Pumps—Turbine—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
**Pumps—Vacuum—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Smart-Turner Machine Co.
**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A.G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
**Roasting Plants—**
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.
**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd
**Roofing—**
Patterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.
**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
ePacock Brothers.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers, Ltd.
**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Hays & Sons.
**Scales—**
Can. Fairbanks-Morse Co.
Peacock Brothers.
Northern Canada Supply Co.
Thos. & Wm. Smith.
**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Can. Allis-Chalmers, Ltd.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.
**Separators—**
E. Leonard & Sons.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.
**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.
**Shavels—Steam—**
Mussens, Limited.
M. Beatty & Sons.
**Slime Tables—**
Diester Concentrator Co.
James Ore Concentrator.
Can. Allis-Chalmers, Ltd.
Chalmers & Williams.
Krupp, Fried. A. G., Germany.
**Smelting Machinery—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Peacock Brothers.
Fraser & Chalmers, Ltd.
**Smelters & Refiners—**
Consolidated Mining & Smelting Co.
**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Allis-Chalmers.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Bros.
Fraser & Chalmers, Ltd.
**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co. Ltd.
Peacock Brothers.
**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.
**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
John Davis & Son.
**Switchboards—**
Canadian Westinghouse.
Can. Allis-Chalmers, Ltd.
Siemens Co. of Can., Ltd.
**Tanks—Cyanide, Etc.—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
E. Leonard & Sons.
Peacock Bros.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.
**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.
**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Can. Allis-Chalmers Ltd
Jenckes Machine Co.
**Transformers—**
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.
**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Sons.
Peacock Brothers.
**Tube Mills—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Fraser & Chalmers, Ltd.
**Turbines—**
Canada Westinghouse.
Peacock Brothers.
Laurie & Lamb.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
Krupp, Fried. A. G., Germany,
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.
**Water Wheels—**
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Krupp, Fried. A. G., Germany.
**Wheels—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Jeffrey Mfg. Co.
**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.
**Wire Cloth—**
Can. Allis-Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.
B. Greening Wire Co.
**Wire (Bare and Insulated)—**
Standard Underground Cable Co. of Canada, Ltd.
**Wire—Magnet—**
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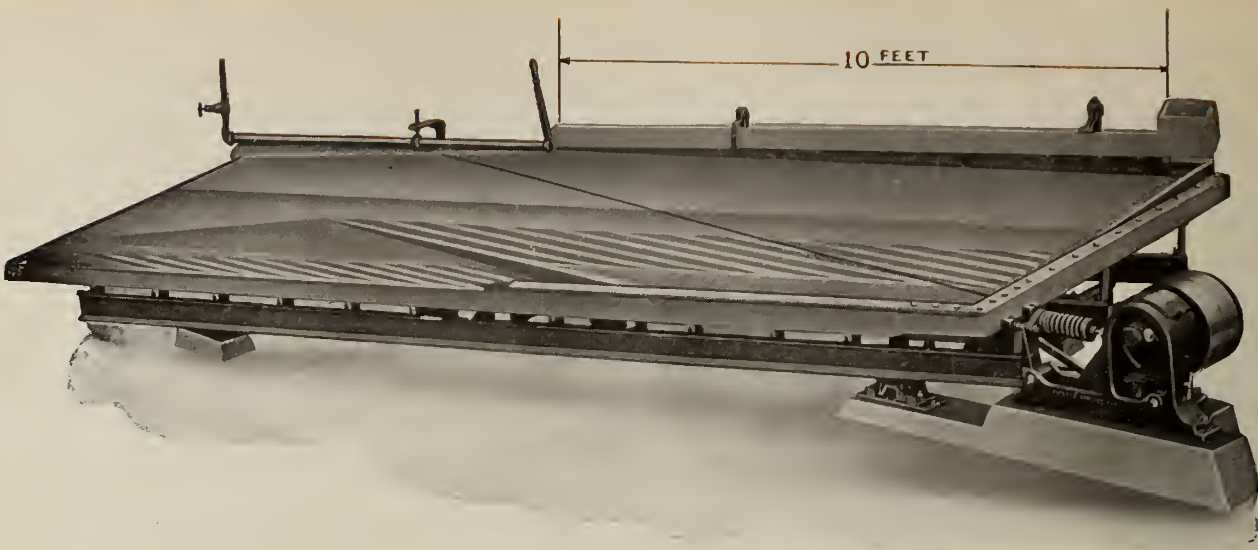


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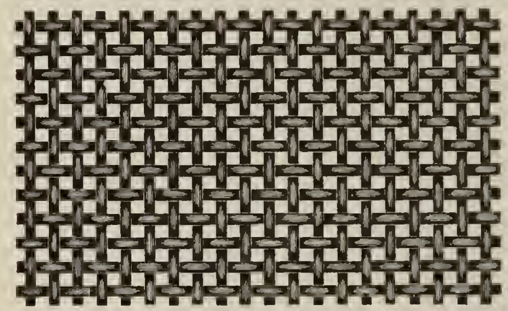



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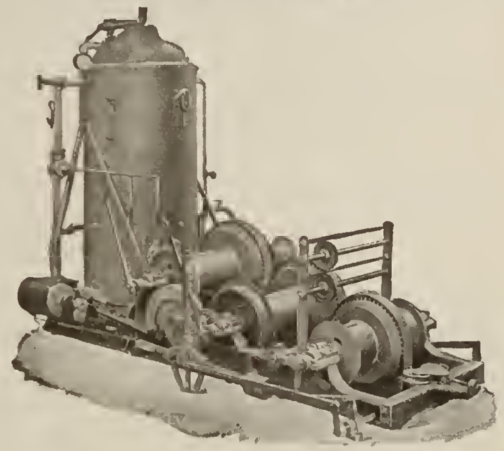

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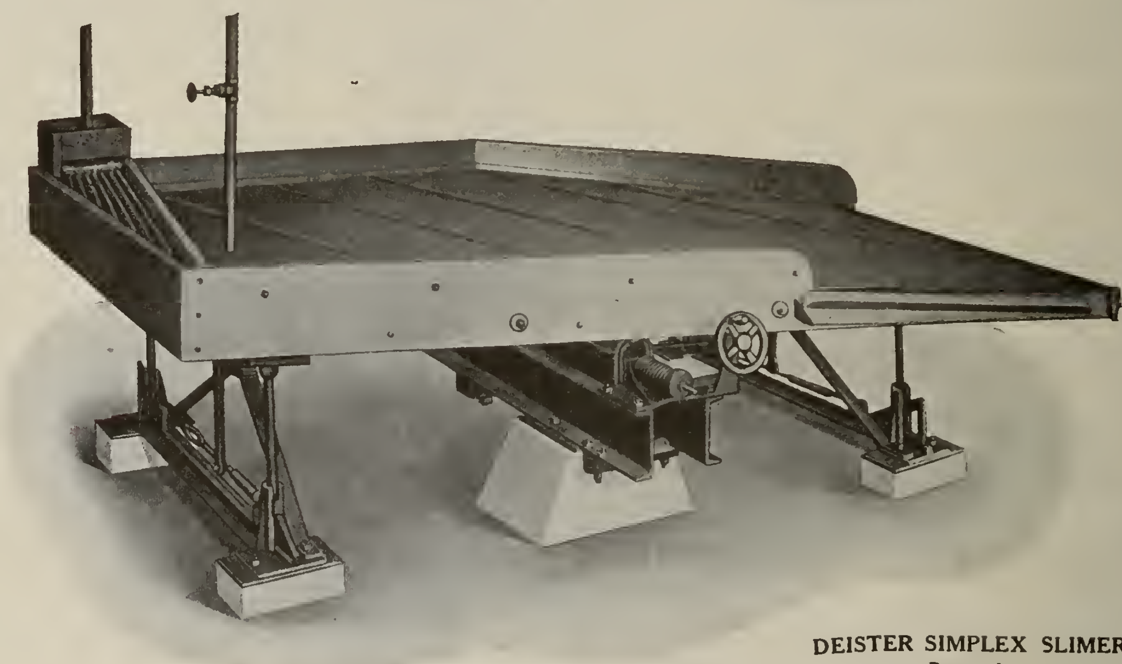

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# THE CANADIAN MINING JOURNAL

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*Editor*

REGINALD E. HORE

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CONTENTS.



## ONTARIO MINERAL OUTPUT INCREASING

The report of production of Ontario mines and works for the first half of the year, prepared by Mr. T. W. Gibson, Deputy Minister of Mines, shows notable increase in total output of metals. There was a slight decrease in silver from Cobalt district; but a large increase in gold from the Porcupine mines. The satisfactory condition of the nickel industry is told by the substantial increase in output of Sudbury mines.

For several years Ontario's total output has shown an increase, and 1913 bids fair to set a new record.

The Cobalt district may be expected to yield less silver than in 1912, and unless some remarkable discoveries are made, there will be a further falling off next year. The very rich ore forms a smaller and smaller percentage of the production of the district It is to be expected, however, that Cobalt will be a very large producer of silver for many years to come.

The Porcupine district is by far the most important producer of gold that has yet been found in Ontario. 1913 will go on record as the first in which Ontario has produced a very large amount of the precious metal. Next year there will probably be a considerably larger production, provided, of course, that labour troubles are avoided.

There is also good reason to expect an increase in output of nickel and copper, as the operating companies are finding a satisfactory market and are preparing to enlarge their plants.

The output of iron is still small, but has increased greatly during the past few years.

## THE GEOLOGICAL CONGRESS EXCURSIONS

It was expected from the announcements describing the excursions to be taken during the summer, that these trips would prove of extraordinary interest to both visiting geologists and to Canadians. Such proved to be the case. Places of special geological and mining interest all across the continent were visited under unusually advantageous conditions. The Dominion and Provincial Governments aided liberally and the transportation companies did their part in a way which won for them much praise.

To the Department of Mines of Canada and to the mining departments of the governments of Ontario, British Columbia, and Quebec belongs most of the credit. The numerous members of these several departments all assisted. Mr. W. S. Lecky, secretary of the Congress, did an enormous amount of work, and did it well. President F. D. Adams, Dr. A. E. Barlow, Dr. A. P. Coleman, H. E. T. Haultain, G. G. S. Lindsey, J. McEvoy, Dr. W. A. Parks, J. B. Tyrrell, T. L. Walker and several others shared the work with the government officials.

The members who visited Canada for the first time were apparently much surprised to find our country so large and our resources so great. Those who have been here before were amazed at the wonderful growth of the past few years. These men will return to their several countries to tell what they have seen and Canada will be better known to the large number of men reached by the reports of our distinguished visitors.

To the Canadian geologists the comments of the visitors on what they saw, the descriptions of similar phenomena in other places and the theories advanced to explain them proved very interesting and useful. Large numbers of specimens were gathered and carried home to laboratories in several parts of the world. The study of these and of the literature and the new interest which the visitors now have in Canadian geology will all help us to interpret the geology of our country. The guide books and maps prepared for the excursions are in themselves a very important contribution to the literature, and will long be useful to those who visit the chief points of interest along the main lines of the railroads and in the mining camps.

## WESTERN FEDERATION STRIKE IN MICHIGAN

The Michigan copper mines are again in operation; but with reduced forces. A few of the mines which were having considerable difficulty in making receipts equal expenditures are still idle, and will probably not be worked for some months. The members of the Western Federation of Miners still refuse to go to work, and the miners at work are all non-union men.

The output of copper is as yet far from normal, but the production shows a gradual though slow increase. The Calumet and Hecla Mining Company has a large number of men at work. The other companies have a comparatively small percentage of their usual working force, and some mines are only able to make a very small daily output.

It is evident that the mines can be operated without the union members and, if the law is enforced, they will be. Since the laws do not compel the operators to recognize the officers of the union as representatives of their employees, the strikers are endeavouring to gain their ends by ignoring the laws. In this they have received considerable encouragement from the actions of the civil authorities.

Every day strikers have endeavoured to prevent miners from going to work. Sometimes they do so by peaceable means, by arguments and by parades made for the purpose of impressing the public with the number of men on strike. To such methods there can be little objection, as everyone recognizes that the strikers should be permitted to use any reasonable means of adding to their numbers.

Frequently, however, and almost daily, the strikers resort to violence and to intimidation by threats. Day after day the workmen have been subjected to insults. Serious conflicts have been time and again averted only by the activity of the soldiers and deputies. Scores of arrests have been made; but, in spite of the fact that the men were taken in the act, nearly all have been freed without punishment. Every such case encourages the strikers to commit further disorders and they are apparently beginning to believe that the laws will not be enforced against them. Recognizing that the local authorities were unable to cope with the situation, Judge O'Brien issued an injunction prohibiting interference with the workmen. A few days later, however, he dissolved it on a technicality and then refused to grant a restraining order to prevent violence and intimidation by threats.

The strikers during the period that the injunction was in force, were comparatively quiet and the workmen were not seriously annoyed. Within a few hours of the dissolution of the injunction, however, the disorder broke out again. The strikers were apparently under the impression that the dissolving of the injunction meant also that the common law was suspended. The workmen were again subjected to forcible interference. Men unconnected with either party were fired on while passing on the public highway. A party of mine guards was met by a fusilade of shots. Finally, last week, one of the deputies was murdered.

Fortunately at this stage the Supreme Court of Michigan ordered Judge O'Brien to show why an injunction should not be issued and in the meantime to put it into force. It is hoped that this action will prevent serious bloodshed.

Throughout the strike there has been practically no discussion of grievances. It is merely a struggle between the owners of the properties and the officers of the Western Federation of Miners. Naturally the owners wish to run their own properties.

The strikers have grievances. They want higher wages, shorter hours, and improved conditions. Some do not want to use the one-man drills.

The average wage paid in Michigan copper mines is comparatively low. A common wage is from \$70 to \$80 per month. There are, of course, many miners making higher wages. Many of those using one-man drills make over \$4, and some over \$5 per day. It is rather peculiar that a demand for higher wages should be made along with one for the abolition of the one-man drill.

Many of the men employed in the copper mines have had very little or no previous experience as miners. Considering their lack of experience it is not surprising that they do not receive high wages. Men of this class are chiefly employed as trammers and earn about \$65 per month. The work is hard; but rests are frequent. Industrious trammers of good physique after a little experience receive much higher wages. Some average \$90 per month.

In a recent statement, President Agassiz says that the pay rolls of the last full month of the Calumet and Hecla show that the miners were receiving an average wage of

$3.66, and the trammers $2.89 net after deductions for medical assessment, etc.

While the wages are lower than in many mining districts, there are advantages which offset this to a considerable degree. The mines are worked regularly, even in periods when the price of copper is very low. The mines are dry and well ventilated. The companies provide houses at low rentals, good schools, hospitals and libraries. Some men do not place a high value on these things, however, and in making comparisons neglect them altogether. They want to make a lot of money by working hard and are willing to live under less favourable conditions in order to attain their end. To such men especially do the wages seem low.

As a matter of fact, men who are willing to work hard are able to earn very high wages by using a one-man machine and working on contract. If they are given two-man machines and less industrious or less experienced partners they cannot make as good wages. Neither man works as hard and the one heavy machine cannot do nearly as much work as two light machines in the character of rock that is being mined in Michigan.

The contention of the strikers, or rather of the officers of the Western Federation, is that there should be a minimum wage, and that the one-man drill be abolished. This is equivalent to asking the managers to ignore the differences in ability of the workers and to pay wages according to number of men employed rather than to amount of work done. Such practice would evidently soon lead to financial ruin, and the mine managers are not likely to make any such agreement with the Federation or with anyone.

The wages paid must depend largely on the profits from mining. The profit depends on the price of copper and on good management. To keep down the costs the managers are constantly endeavouring to find better machines and better methods. The adoption of these results in larger profits and, therefore, in the possibility of increasing wages. It is the desire of all managers to reduce the hours of labour and increase the wages. To do this in the face of a low price for the product means that there must be increase in efficiency. When the strikers realize, as the men at work realize, that the interests of employer and employee are the same, they will have made a real step forward in their campaign for a larger return for their labour.

## IRON DEPOSITS OF QUEBEC

The Bureau of Mines of the Province of Quebec has in preparation a work by Mr. E. Dulieux describing the iron ore deposits of the province and their possible utilization. In the reports on mining operations for the years 1911 and 1912, Mr. Dulieux describes most of the deposits and this work will furnish the basis for the more elaborate report.

The iron production of Quebec in recent years has been very small. A little bog iron ore has been mined and used in local furnaces; but the report for the year 1912 shows no production whatever.

It is to be hoped that the publication of Mr. Dulieux's monograph will direct more attention to the ore deposits.

## WESTERN OIL AND GAS FIELDS

A memoir is being prepared by Wyatt Malcolm, of the Geological Survey, to lay before the public what is known regarding the oil and gas possibilities of the northwestern provinces of Canada.

There are large areas of formations in which oil and gas may be reasonably expected to exist. Comparatively little has yet been done to test the possibilities.

There are a few areas already proven. At Medicine Hat and Bow Island gas has been found in paying quantities. Prospecting for oil has as yet met with little success.

The development of the West is creating a splendid market for oil and gas. The gathering together of all the available knowledge will aid exploration and will be much appreciated by those who are searching for commercial deposits.

## MINE TAXATION

One of the leading topics for discussion at the meeting of the American Mining Congress at Philadelphia during the week of October 20 will be taxation laws for mines. Colorado, Arizona, Pennsylvania, and Michigan have new systems of taxation. Many mining men claim that they are overtaxed under the new systems and considerable airing of views is expected.

The system of taxation introduced by J. R. Finlay in his appraisal of the mines of Michigan resulted in much criticism; but in a re-appraisal of the mines in 1913, Mr. R. C. Allen, Director of the Michigan Geological Survey, has shown that the system, modified somewhat, is reasonably fair to the mine owners if the appraiser has time to acquire an intimate knowledge of the character of the ore bodies and the costs of mining and marketing the ore.

Mr. Finlay bases his calculation on three factors: average cost, present prices, and an estimate of future life. The third factor is determined partly by developed ore and partly by assumption of continuance of known ore bodies beyond the bottom levels of the mines. The assumption for continuance is based mainly upon the extent to which the continuity of the deposits has been proven for the district and for the type to which the mine belongs.

The third factor to be properly applied must be used only after careful study of the structural features of the ore bodies. The Michigan Tax Commission has consequently asked the Director of the State Geological Survey to make the estimates. During the past summer this has been done in the Michigan iron districts and the results are regarded as very satisfactory.

It is intended that the Geological Survey shall annually revise the estimates. The revision, compared with the first estimate, will be comparatively simple, and a more accurate record will be obtained than is possible by the more costly special commissions.

## HOLLINGER DIVIDENDS

Hollinger Gold Mines, Limited, in the period January 1 to September 9, of this year, made a profit of $1,139,267. Shareholders have during the past year received $1,170,000. The mine is reported to be in good condition and the cost per ton has been lowered.

The good record of the Hollinger is all the more noteworthy because of the fact that operations were seriously interfered with for some months by a strike ordered by officers of the Western Federation. The strike was quite unsuccessful; but the industry suffered considerably from the activities of the agitators.

## MINING WORLD INDEX

The publishers of the Mining and Engineering World, Chicago, have issued the third volume of an index which has proven very useful to those who have occasion to refer to the literature on mining subjects. This third volume covers the half-year period, January to July, 1913. The compilation of such an index means a great amount of work, and the editors are to be congratulated on its comprehensive character, simplicity of arrangement and early appearance. For ready reference to the current literature it is invaluable.

# COPPER ORE IN ALBERNI DISTRICT, B.C.

Copper ore in Alberni district is to receive attention, the Ptarmigan Mines Co. having been organized to prospect and develop mineral claims in the vicinity of Great Central Lake. Seven years ago Mr. Herbert Carmichael, Provincial Assayer and Assistant Provincial Mineralogist, visited that part of the island and made a report which was printed in the Annual Report of the Minister of Mines for 1906. The following was his introductory account of what he saw there: "Considerable bodies of ore having been reported to exist at the head of Great Central Lake, Alberni district, it was decided to make a preliminary examination of that region, which was done toward the end of August, 1906. Great Central Lake can now be reached with ease from the town of Alberni, a distance of 12 miles, by wagon road, the elevation of the lake being 200 ft. above the sea. This inland sheet of water presents the same physical features as do the inlets which indent the west coast of Vancouver Island, the mountains rising abruptly from the water, with here and there a valley extending back for a considerable distance, the most important valley being that extending to Ash Lake on the northeast. The general length of the lake is east and west, and it is about 25 miles long by a mile or so wide. At its western end two creeks flow in, heading from mountains still farther to the west. A trail from the lake follows the more northerly of these creeks on a gradual ascent for a distance of ten miles until it ends in a basin, shut in by high mountains, the basin having here an elevation of 1,500 ft. above the Great Central Lake and 1,700 ft. above the sea. To the south a precipitous bluff rises 2,075 ft. high, from which pours a considerable stream of water that barely touches the rocks until it reaches the bottom, breaking into a mass of spray in its descent. The ascent of the bluff requires stout muscles and the aid of the small bushes which cling so tenaciously to the clefts in the rock. On the top there is a small rocky plateau or basin enclosing a lake about half a mile long by a quarter wide, the elevation of the lake being 3,350 ft. above the sea. This mountain lake, situated in the heart of Vancouver Island, with snow-clad mountains rising 2,000 ft. above it, and the blue crevassed glacier of the 'Nine Peaks' showing up to the south in the morning sun, forms a beautiful scene."

After having given some particulars of the Big Interior group of seven mineral claims, Mr. Carmichael summarized as follows: "The mineralized zone, showing in the face of the cliff to the north of the basin and forming the great mass of low-grade mineral on the property, is so large, so inaccessible, and the mineralization so scattered, that it would be impossible to obtain anything approximating an average general sample of the exposure without the expenditure of time and money not justifiable under the circumstances. However, at the foot of the cliff, there is a talus extending the whole length or width of the mineralized zone, made up of material broken away from the whole face of the zone in question. While this talus may to a certain extent have been affected by weathering, it still may be considered a very approximate sample of the inaccessible cliff. Samples were taken from this talus, from which it is judged that approximately the central portion of the mineralized zone will assay from 0.5 to 1 per cent. copper, with from 1.5 to 2 ozs. of silver per ton, and a trace of gold. This value extends over a width of about 1,500 ft., while to the right the mineralization gradually fades off into the country rock. To the left of the mineralized zone is what has been called, for purposes of designation, the 'brecciated zone,' and which is merely a continuation, to the left, of the mineralized zone which has here been subjected to a crushing due to movement, and in which the interstices between the fragments of the rock have been filled with secondary minerals, chiefly calcite, with some carbonate of copper forming a secondary enrichment. This secondary enrichment has taken place, as would be expected, along defined channels, producing streaks of higher-grade mineralization often forming commercial ore. Here, again, no general sampling was possible, although a tunnel has been driven for some 31 ft. into the bluff it was found impossible to examine the face of the cliff for ten feet on either side of the tunnel mouth. The mineralization just described, and which forms the great bulk of visible mineralization on the property, is admittedly very much diffused through the rock, and is, consequently, so low-grade as to be of value only if found to be amenable to some form of concentration, and of which there seems to be a fair probability."

# ASBESTOS MINING IN QUEBEC

By Reginald E. Hore.

**Asbestos veins in peridotite, Black Lake, P.Q.**

Quebec is the world's chief source of asbestos. This material, being the best fireproofing material known, is in constantly increasing demand, and the industry has in recent years become a very important one. During 1912 the asbestos mining companies in Quebec employed 2,910 workmen, paid wages amounting to $1,377,444, and produced asbestos valued at $3,059,084.

The production from other countries is comparatively small. Russia is the chief producer outside of Canada. Most of the Russian asbestos is used locally or exported to Germany. A little reaches the United States and enters into competition with the Canadian product. The United States is the chief manufacturer of asbestos products and depends on Canada for the raw material. The Canadian exports of asbestos during the year 1912 were reported by the Dominion Customs Department as 88,008 short tons valued at $2,349,353. Of this quantity 71,426 tons was shipped to the United States, the remainder going chiefly to England, Germany and France.

The following table from a report by Mr. J. S. Diller, of the U.S.G.S. shows Canada's pre-eminent position as producer of asbestos:

**Asbestos vein in peridotite, Black Lake, P.Q.**

**The asbestos is the thin central portion only. It is enclosed by serpentine.**

**World's Production of Asbestos, 1900-1911, (in short tons):**

| Country. | 1900.* | 1901.* | 1902.* | 1903.* | 1904.* | 1905.* |
|---|---|---|---|---|---|---|
| United States | 1,054 | 747 | 1,005 | 887 | 1,480 | 3,109 |
| Africa— | | | | | | |
| Cape Colony | 174 | 99 | 45 | 305 | 411 | 501 |
| Natal | .... | .... | .... | .... | .... | 1 |
| Rhodesia | .... | .... | .... | .... | .... | .... |
| Transvaal | .... | .... | .... | .... | .... | .... |
| Australia | 101 | 52 | .... | .... | .... | .... |
| Canada— | | | | | | |
| Asbestos | 21,621 | 32,892 | 30,219 | 31,129 | 35,635 | 50,669 |
| Asbestic | 7,520 | 7,325 | 10,197 | 10,548 | 13,011 | 17,594 |
| Cyprus | .... | .... | .... | .... | .... | .... |
| India | .... | .... | .... | .... | .... | .... |
| Russia | 4,238 | 4,927 | 4,968 | 5,803 | 8,269 | 8,009 |

| Country. | 1906.* | 1907.* | 1908.* | 1909.* | 1910.* | 1911. |
|---|---|---|---|---|---|---|
| United States | 1,695 | 653 | 936 | 3,085 | 3,693 | 7,604 |
| Africa— | | | | | | |
| Cape Colony | 522 | 604 | 1.267 | 1,674 | 1,403 | † |
| Natal | .... | .... | .... | .... | 3 | † |
| Rhodesia | .... | .... | 55 | 272 | 332 | † |
| Transvaal | .... | .... | .... | .... | 77 | † |
| Australia | .... | .... | 45 | 3 | .... | † |
| Canada— | | | | | | |
| Asbestos | 60,761 | 62,130 | 66,548 | 63,349 | 77,508 | 100,893‡ |
| Asbestic | 21.425 | 28,296 | 24,225 | 23,951 | 24,707 | 26,021‡ |
| Cyprus | 21 | 99 | 521 | 172 | 487 | † |
| India | .... | .... | .... | .... | 3 | † |
| Russia | 10.142 | 11,497 | 13,129 | 14.654¶ | 12,193¶ | 17,071¶ |

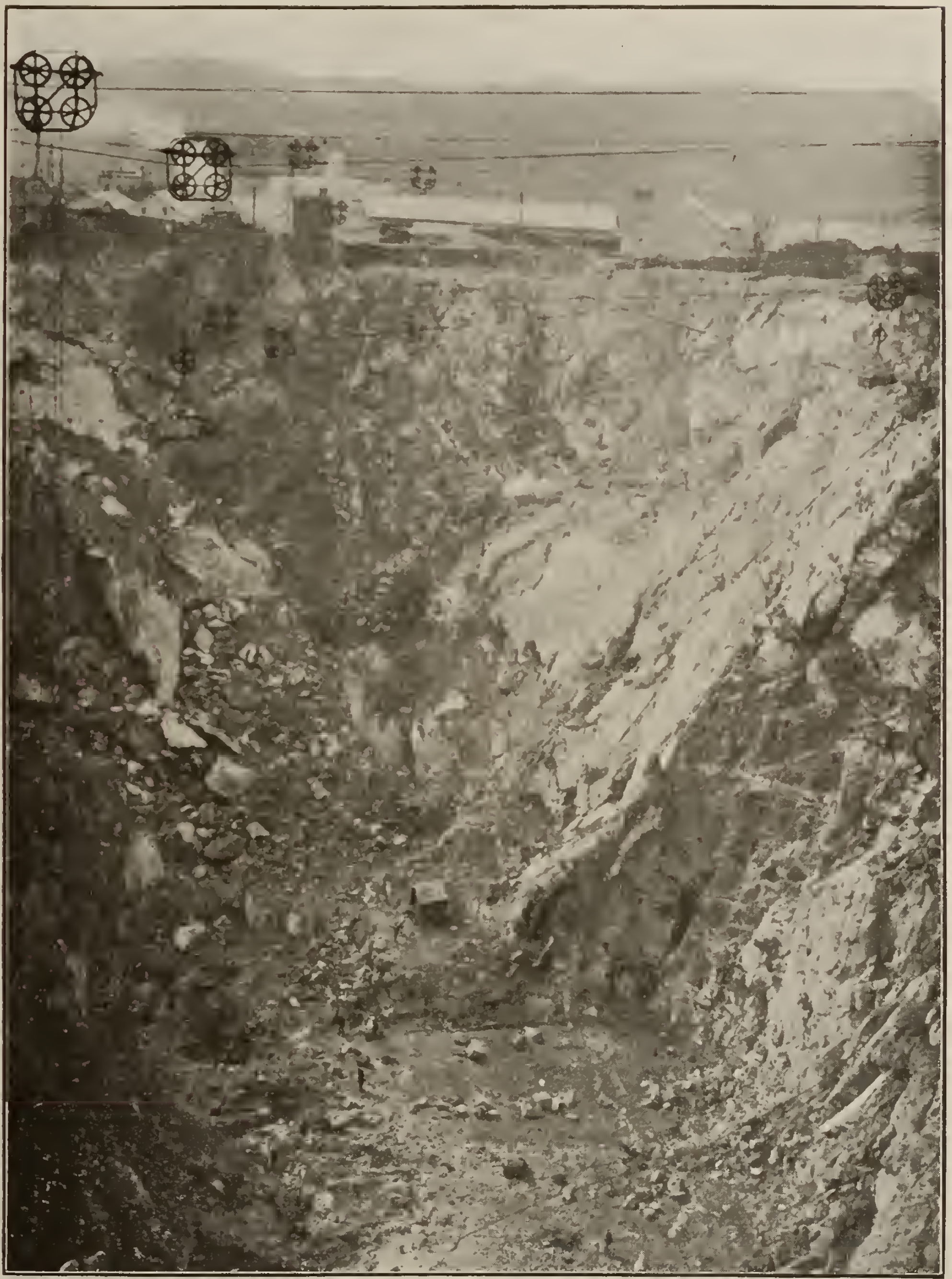
*Statistics taken from mines and quarries: General Report with Statistics, pt. 4, London.
†Statistics not available.
‡Report on the mineral production of Canada, calendar year 1911, Ottawa.
¶Min. Jour., London, Mar. 9, 1912, p. 228.

**Asbestos mining at Thetford, P.Q.**

**Showing method of raising asbestos from open pits. Mill at left under characteristic dust cloud.**

Canada's asbestos mines are located in the Eastern Townships, Province of Quebec. The chief producers are at Thetford, Black Lake, Danville, and East Broughton.

The asbestos occurs in thin irregular veins traversing masses of serpentine rock. The veins are seldom more than two or three inches thick, though occasionally they are five or six inches thick for short distances. The asbestos is of a variety known as chrysotile. It is finely fibrous and has a silk-like lustre. The fibres are arranged transverse to the walls of the vein and are hence very short. Frequently the fibres extend from wall to wall and hence have a length equal to the thickness of the vein—a few inches. Commonly, however, there is a parting in the thin vein and then the fibres are even shorter—extending from the parting to either wall.



**Asbestos Mining at Thetford, P.Q.**

## Method of Mining Asbestos.

As the thin veins traverse the rocks in all directions and do not continue for great distances it has not been found possible to mine the veins individually. The practice is to break the rock containing veins and then sort out the asbestos from the waste rock. Usually the veins are not confined to a narrow zone; but extend in all directions through masses of serpentine. Hence the openings made in mining are very large and it has been found advisable to do most of the mining, or quarrying, as open cuts. At one property some underground work has been done; but most of the production is from open cuts such as those illustrated in the accompanying photographs. It will, therefore, be evident that the production varies with the weather. In winter, comparatively little work is done.

Lying on the asbestos bearing rock there is a deposit of soil varying in thickness. At Thetford it is about 15 ft. thick. It is removed either by steam shovels or by hand shovels, loaded into cars and drawn away.

When the overburden has been removed the rock is broken down in a series of benches by the use of dynamite. Machine drills are used in most of the mines, but hand drilling is the practice at some of the smaller properties.

The broken rock is sorted and the best quality of asbestos, known as long fibre, is picked out by hand. Rock containing short fibre and all the fine material is sent to the mill. The remaining rock is piled on the waste dumps.

To hoist the ore from the pits cable derricks are used. A rope is stretched across the pit and a carrier is sus-

Bell Asbestos Mine, Thetford, P.Q.

Geological Congress visitors viewing method of drilling and handling the ore.

pended from the rope along which it travels by a system of pulleys as may be seen in the accompanying photograph.

**Hand-Cobbing.**

At the mills the higher grade mine product is broken up by hand. Heavy hammers are used to break the rock. The fibre thus separated from the rock is cleaned by girls using smaller hammers. The product from hand-cobbing is the asbestos known as 'crude' and is ready for the market.

**Mill Treatment.**

The discards from the cobbing sheds and the rock sent directly from the mine to the mill are treated mechanically. The material is first dried by exposure to the air, by steam pipes or in rotary dryers. The rock is then first crushed in jaw or gyratory rock-breakers, and then by rolls or in machines known as fiberizers and cyclones.

The material from these machines falls on a screen and the fibre is picked up by the suction produced by a fan. The fibre is then classified by treatment on grading screens into long and short fibre.

## DUTY ON LEAD AND ZINC

A press despatch from Washington, D.C., states that in connection with the United States Tariff Bill, representatives of the Senate and House in conference have agreed to an adjustment of differences in regard to duties on lead and zinc, as follows: House representatives receded from their position requiring a rate of one and a half cents a pound duty on lead and accepted the Senate's rate of three-fourths of one cent a pound. Senate representatives yielded to the decision of the House that the rate on zinc ore be ten per cent. instead of twelve and a one-half per cent., as asked by the Senate.

Asbestos bearing rock, Black Lake, P.Q.

# DEVELOPMENT OF THE ASBESTOS MINING INDUSTRY IN QUEBEC*

By Fritz Cirkel.

The use of asbestos can be traced back to ancient times. The Romans drew their supplies from the Italian Alps, and even from the Ural. They imagined it to be of vegetable origin; the highly silky appearance and unctuous feel giving them the impression that it was an organic substance.

It is said that cremation cloth, in which dead bodies were enwrapped to be consumed by fire, was made of asbestos. It appears, however, that the high cost of making this asbestos cloth militated against its general use. Pliny refers to it as a rare and costly cloth—"linum vivum—the funeral dress of kings" he calls it; evidently assuming that it was of vegetable origin. The fibre used came from the Italian Alps and was called "amianthus." It was apparently very difficult to spin, on account of its shortness; but judging from a piece of asbestos cloth on exhibition in the Vatican, and which is said to have originated in the days of ancient Rome, it is certain that vegetable fibre was intermixed with the real asbestos fibre in the making of so-called asbestos cloths. There is, moreover, according to Sir E. J. Smith, in the library of the Vatican, a winding sheet of Italian asbestos, which, although very coarsely made, is of a very soft and silky texture. This piece of cloth—perfectly preserved—was, together with some ashes, found in a sarcophagus in the Via Praenestina in 1702. It was subsequently placed in the Vatican Library by order of Clement XI. It appears that some vegetable fibre was used with real asbestos fibre in the making of the cloth; because it is reported that, when fire was applied at one end of the cloth, it burned with brightness, but leaving the real mineral fibre intact.

When Marco Polo was travelling in the thirteenth century through Siberia—at that time known as the Great Empire of Tartary—he was shown some cloth that withstood the action of fire. Marco found that it was made of a fibrous mineral called "amianthus," which resembled the Italian asbestos. Upon further investigation he found that the ore from which this fibre was extracted was first dried and then pounded in a mortar. After the impurities had been eliminated, the pure silky fibre left was used in a spinning process, the modus operandi of which is unknown. The fibre referred to in Marco Polo's travels, was long, beautifully white and silky; and probably belonged to the variety known to-day as "hornblende asbestos." This same variety is found in Corsica. Before its real value became known, it was used as a packing tow, and Dana reports that Dolomiea when packing up minerals for his collection on that island, used it in tying the boxes.

That asbestos was used in ancient times as lamp wicks is recorded by Plutarch, who called them "perpetual"; for the reason that the wicks never seemed to wear out. These lamps were principally used by the Vestal Virgins. The wicks, made of delicate asbestos fibre, formed small tubes through which the oil passed, while the wick itself remained intact. Pausanian mentions a lamp that was filled with oil only once a year; he evidently attributes to the oil what should have been credited to the wick—which was not consumed at all. He notes that the wick was made of "Carpasian" linen, referring to a mineral fibre obtained from Carpasius in Cyprus. It is said that Kirchner, the German philosopher, used in his library a lamp which had a wick made of "amianthus." Whatever the uses of asbestos may have been in days of old, it is certain that its peculiar non-combustible and spinning qualities were recognized and taken advantage of from the first; but it remained for modern times to make the mineral of commercial utility and an important factor in the industrial market of the world.

Although the discovery of this mineral is attributed to the Romans, who, as already related, mined it in a small way in the Alps, the knowledge of its existence—which may not have been more than local—apparently lapsed. Only in a few instances is it mentioned, or its utilization referred to in the literature of the middle ages. It appears that in the year 1720, asbestos was discovered in the Ural Mountains; and forty years later—under the reign of Peter I.—a factory for the manufacture of asbestos articles was established near the Naviansky works. But the known uses were so few, and the demand so limited, that the industry subsequently disappeared; and it was not until some forty years ago that technical interest in the mineral was revived in Europe. In the domain of applied mechanics its non-combustible properties were no sooner realized, than investigation of its nature and utility was begun in earnest—with a view to its application on a commercial scale. Since 1860, the search for asbestos has been incessant; the exploitation and development of the deposits discovered remarkable; and the progress made in the invention of mechanical methods of refining and preparing the mineral for utilization in the industrial world simply marvellous.

The first modern attempt to exploit asbestos deposits was made in the Aosta valley of the Italian Alps by a London syndicate, for the purpose of experimenting on a large scale; and almost simultaneously with the exploitation in Italy asbestos was discovered in the Des Plantes River region, between St. Joseph and St. Francis villages, Province of Quebec. At the exhibition in London, in 1862, a specimen of fine, silky-fibred asbestos from the above locality was exhibited.

The extension of the belt of serpentine rocks in which the mineral was known to occur had been traced with some care from the Vermont boundary in the township of Potton, to and beyond the Chaudiere River; but the deposits of asbestos discovered were comparatively limited. All attempts to work them profitably failed, and during the next fifteen years nothing was done in the way of exploration or exploitation.

In 1877, however, asbestos was found in another district in Quebec; this time in the serpentine hills of Thetford and Coleraine. The credit of this discovery is claimed by Mr. Robert Ward; although by others it is stated that the first find was made by a French-Canadian named Fecteau. Following closely upon this discovery several parties secured areas both at Thetford and Black Lake in Coleraine Township, close to the line of the Quebec Central Railway, which, for some miles, runs through a belt of serpentine. Large fires having swept over the country, destroying all forests, the discovery of veins was facilitated by the weathering of the mineral on the surface.

Mining operations on a small scale commenced in 1878, and in this year fifty tons were produced; but it was difficult to find a market. The quality of the fibre mined was excellent, and the width of the veins every-

*Extract from monograph published by Department of Mines, Canada thing that could be desired, being from ½ inch up to 2 inches, 3 inches, and sometimes 4 inches. This justified the expectation that large deposits of the mineral might exist in that locality, though their true importance and value were not ascertained for several years later. Shipments of the better grades to London created quite a sensation in the British market; hence extensive tests and investigations were made, with the result that, on account of its exceptional spinning qualities, high prices were soon established, and the race for the acquisition of additional areas likely to contain the valuable mineral began. The land upon which the asbestos was found was considered of very little practical value, either for agricultural or any other purposes, and mining operations were rapidly extended. The principal areas in which the asbestos-bearing serpentine was found to occur were lots 26, 27 and 28, near the line between ranges V. and VI. of Thetford, and in the township of Coleraine near Black Lake station, four miles southwest of Thetford station, in an area previously unsurveyed; but adjoining, on the south-west, range B, also on lots 27 and 28, range B; and on lot 32, range C. All these areas were speedily secured, as well as most of the serpentine-bearing ground extending south-eastward from the Quebec Central Railway towards Caribou Lake and for several miles along the Poudrier road.

During the next twelve years a rapid development of the asbestos industry was witnessed. The mines were operated on a large scale; while prospectors were busy exploring the hills of the surrounding country for new deposits of the mineral. Villages sprang up in the vicinity of the mines as if by magic, although the country—physically speaking—was sterile and very rough. Prior to the beginning of mining operations, the population consisted of only a few scattered families, but now increased to several thousands, and the whole country showed all the marks of industrial activity and prosperity.

In 1885, it was reported that seven quarries were in operation, which produced during the same season an aggregate of about 1,400 tons of asbestos. The prices obtained for the different grades were: First quality, $80 per ton at the mines; second quality, $60; third quality, $40, and the lower grade—suitable only for pulp—$10. The total number of men employed by the various operating companies was 350; distributed as follows: King Bros., 40; Boston Asbestos Packing Company, 100; the Johnson Company, 100; Ward Bros., 20; Lionais and Company, 40, and Irwin & Hopper, 50.

Dating from 1885, a gradual increase in the prices took place; especially for the first and second qualities. In 1900, about $300 was realized for the first quality. This and other economic features in connection with the industry, served to give a powerful impetus to the development of the existing asbestos resources; additional mines were opened; the demand for the mineral continued brisk for a time; and properties were sold at a high figure. At a meeting of the Bell Asbestos Co., Ltd., held January 30, 1889, at the Cannon Street Hotel, London, England, the chairman, Mr. John Bell, announced a dividend of 22½ per cent. on the capital stock of the company for the year 1888, and said that the large growth of the asbestos business in general promised even better prospects for the current year.

But this state of affairs did not continue long; prices began to drop gradually, the demand slackened, and it was discovered that the prevailing methods of hand extraction were faulty, inadequate and expensive, especially with regard to the lower grades. As a matter of fact, under prevailing price conditions, only those quarries which were working on rich ground, and had a large percentage of crude asbestos, had a chance to live, and carry on operations with a profit. The natural outcome of these adverse conditions was obvious; many quarries producing only a very small percentage of the higher grades were forced to shut down; and this, together with serious difficulties accentuated by overproduction and a consequent fall in prices, caused the industry to receive a severe set back in the middle of the nineties. For some years the industry languished, and this had a depressing effect on all except those who would not be discouraged, or who were naturally optimistic.

Those engaged in the quarries and those having the development of the industry at heart perceived that only one thing could save the industry, namely, a more economic production; hence they began to exercise their inventive powers; the result being that mechanical treatment of the lower grades of asbestos gradually displaced hand-cobbing; and this method, in the course of years, was applied with such conspicuous success that, to-day, every quarry in the district is equipped with a complete milling and fiberizing plant. By means of this improved process, all the smaller fibre—which in the earlier years was left in the rock and thrown into the dump—was saved; and as new demands for this short material sprang up, the life of a quarry was prolonged, and its operations performed with greater ease and economy.

The quarrying and production of asbestos in the Eastern Townships of Quebec is, to-day, one of the most prosperous industries in the Dominion of Canada. Previous to the discovery of this mineral, the district was but sparsely populated—being in a like condition to the famous Cobalt region prior to the discovery of silver—but continued success in exploitation and development has attracted thither a large mining and trading class, hence the population has rapidly increased during the last ten years. This result was brought about by the excellent quality of the product of the quarries; the practically unlimited supply of the mineral; the untiring efforts which were made by the proprietors and managers to effect mechanical separation and last, but not least, by the opening out of the Quebec Central Railway, which runs through the region. Indeed, it is doubtful whether the Canadian asbestos industry would have attained its present prominence and prosperity had it not been for the transportation facilities afforded from the beginning by that railway. The author knows of no mining camp in Canada where transportation facilities are as convenient as in the asbestos region of Quebec. The productive asbestos area—as determined by the author—now extends over twenty-two miles. In all this stretch not one productive quarry is located farther than one mile from the railway track; and as the latter runs generally parallel to the asbestos range, and since there is still room along the belt for the opening up of more quarries, every new establishment will participate in these special transportation facilities. Unless foreign asbestos fields yet unknown, having equal ease of access, produce the same quality and quantity of the mineral as the serpentine region of Quebec, the Canadian asbestos industry will continue to be the chief source of the world's supply.

During the last twelve years, new fields have been discovered in various parts of the globe; but as a matter of fact, none of the deposits so far discovered produce asbestos which compares favourably with the Canadian article, either in quality or quantity.

# KERR LAKE MINING COMPANY ANNUAL REPORT

### Report of President.

In his report to the shareholders of the Kerr Lake Mining Company for the year ending August 31st 1913, President William G. Nickerson said, on September 16th:

This year we have produced 2,109,975 ozs. of silver, and have reduced the reserves by only 600,000 ozs., leaving still approximately 6,000,000 ozs. of actual ore in reserve. This gain in silver is due to some important additions to reserves and to the excess of production in milling and high-grade ore over estimate, and to a much more liberal estimate of value of milling ores, justified by the year's production of same.

The total cost per ounce of silver is slightly higher, owing to a much larger production of low-grade ores with proportionately higher treatment charges. We also have charged to cost many improvements at the mine.

I visited the mine on the 12th of September, and found that Kerr lake had been lowered approximately fifteen feet. The ultimate success of the draining of the lake seems assured, and its importance has been already demonstrated by the discovery of several small, but very rich veins, formerly under water and not hitherto discovered by our underground explorations.

Much to my regret Mr. Susmann resigned his duties as your Secretary and Treasurer, but your company still retains the privilege of his valuable advice.

Your company is most fortunate in securing the services of Mr. Westlake as Secretary and Treasurer.

I wish to congratulate Mr. Livermore, General Manager, on the efficiency which he has shown in managing your mine and his success thus far in draining the lake.

### Report of Manager.

The report of the Manager, Robert Livermore, is, in part, as follows:

**Production.**—The gross production from all ores, for the year ending August 31st, 1913, amounts to 2,109,975 ozs. of silver. This figure includes 34,289 ozs. of silver on hand, August 31st, 1913, according to inventory. Of the total, 1,575,334 ozs. were produced from shipping ore, and 534,641 ozs. from low-grade ore milled by the Dominion Reduction Co., Ltd., at Cobalt.

**Development.**—Most of the known veins having been well blocked out, development work was reduced from the amount maintained last year to between four and five hundred feet a month, a rate more in proportion to the other work of the mine. In all, 4,984 linear feet were done, including drifting, sinking and raising, as against 8,481 feet last year.

Exploratory work in the more unprospected parts of the property was conducted by long crosscuts in the central and east central portions. That in the central part did not disclose any veins of value, the conglomerate formation being found shallow, and soon changing to the more unfavourable Keewatin formation. In the east central part, a crosscut driven north from Little No. 3 shaft cut several veins, which were generally small and irregular, but in some of which a fair amount of second-grade ore, with some mill rock in the walls, was found. The conglomerate here, too, is shallow, but should be found to deepen as the work is carried to the north. In this work Nos. 23, 24, 25 and 27 veins were discovered, and No. 4 vein, formerly opened by an isolated shaft, was further explored by drift. Of these veins, Nos. 23, 24 and 25 contained the only profitable ore. Nos. 4 and 22, the latter discovered last year, and No. 27 had only low values. In the three first mentioned veins assays from 50 to 2,000 ozs. were obtained, and a little production of high grade was made in development. Further work must be done upon these veins before it will be known of how much importance they are as reserves.

In No. 3 vein the main work consisted of sinking the winze below the sixth level. From this winze, two drifts, Nos. 7 and 8 levels, were driven. All of this work opened only ore of too low grade to be called an addition to the reserves. Sinking on the vein was finally discontinued at a depth of 487 feet below the collar of the main shaft. At this depth the formation has changed from diabase to Keewatin, and the vein, although still fairly strong, is barren of value.

In No. 7 shaft, connection was made between the 225 ft. level and the main shaft. The Fleming vein was also connected by crosscut to this shaft at the same level. By means of this work pumping and hoisting through separate winzes has been abandoned, and all water and rock is handled through the main shaft.

New developments above the 225 ft. level were not of great importance, although two new veins were found on the 140 ft. level, called Nos. 26 and 20A. Both of these veins are narrow, and contain only second-grade ore. Development and stoping on No. 7 vein proved the ore to exist a greater distance south of the shaft than was supposed, and several very rich shoots were taken out above the 90 ft. level. On the 140 ft. level, an extension to No. 8 vein was found which assayed over 2,000 ozs. over a width of 1½ inches for sixty feet.

The most important development of the year was upon the Fleming vein. As mentioned above, a crosscut was driven on the 225 ft. level, which opened the vein at this depth, and a drift was run on the vein nearly to the east boundary. This drift opened ore of much the same

**Ore Production for the Year Ending August 31st, 1913.**

| Grade of Ore. | Net Weight, Pounds. | Silver Contents, Ounces. | Average Silver Content per ton. Ounces. |
|---|---|---|---|
| 1st Class | 768,988 | 1,287,035 | 3,347.00 |
| 2nd Class | 323,030 | 72,783 | 450.60 |
| Jig and Table Concentrates | 383,020 | 183,682 | 959.10 |
| Bullion from Metallics | ...... | 31,834 | ...... |
| Mill Ore | 18,252.3 tons | 534,641 | 29.29 |
| | | 2,109,975 | |

August estimated in part.

grade and appearance as that had on the level above. The general run of ore may be said to be good second grade and mill rock, but there are occasional shoots of very high-grade ore. Beside the drift, a raise was driven to connect with the upper level, and a winze sunk to explore at fifty feet deeper, on the 275 ft. level. An interesting fact is that most of the ore shoot on the 225 ft. level is in Keewatin formation, while it was in conglomerate on the upper level. It has been found in most of the explorations in the district that the veins lose their value and strength with the change of formation from conglomerate to Keewatin, and this would seem to be an exception, but it is probably only one to the extent that it carries its value a little further into the Keewatin than usual, and at greater distance away from the contact the same conditions will apply as with other veins. Nevertheless, the developments to date have added a very fair amount of ore to the reserves in this vein, and as some good ore has been recently found on the 275 ft. level, also in Keewatin, it is reasonable to expect that the greatest depth of the ore shoot has not yet been reached. No stoping has been done on the Fleming vein.

Developments for the coming year will continue the work in the still unprospected parts of the property, notably the conglomerate in the northeastern and central sections, and at depth on the Fleming and No. 10 vein systems. A crosscut will be driven from the sixth level of No. 3 shaft to connect with No. 2 vein. This is a strong calcite vein in diabase from which some very good ore was taken near surface, but which has been little explored at depth. Other work will be in following up the veins soon to be opened for exploration by the draining of the lake, mentioned hereafter.

**Stoping.**—During the year stoping was distributed over most of the reserves, with the exception of the Fleming, where production was entirely from development. In general it may be said that the reserves produced more silver than was expected for the ground removed, and less of the available reserves were stoped than was anticipated.

The Big Chamber above the 140 ft. level was most largely drawn upon for the production, but still has a large amount of ore left in place. No. 7 vein furnished nearly as much silver mostly from the blocks south of the shaft, above the 90 ft. level. The best part of this vein is still in reserve. No. 10 vein produced well from the block under the fourth level. None of the stopes on the vein above this level have been drawn upon during the year. The main east vein was stoped for a short distance above the 140 ft. level, but the greater part was left intact. The McDonald production was drawn mostly from broken reserves made last year, and little new stoping was done. In No. 3 vein, all known ore was removed, as it lay in small pillars which were rapidly becoming inaccessible from caving ground.

In consequence of the growing importance of ore of milling grade, it was found necessary to carry the stopes much wider than formerly to mine the ore of this class occurring as veinlets and leaf silver in the wall rock next to the high grade veins. Because of these wide stopes, which in places are twenty feet in width, in order to support the ground and mine the ore efficiently the square-set method of timbering has been adopted and carried through a large portion of the mine.

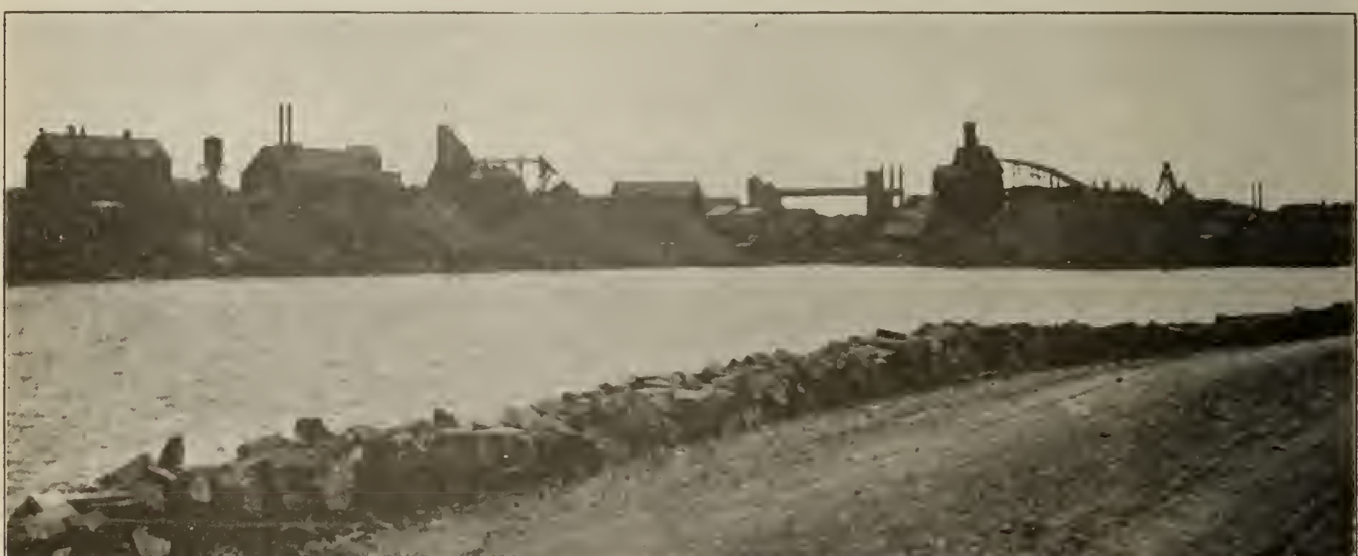
**Ore Sorting and Jigging Plant.**—No changes have been made here, the present plant being ample to treat the product for which it was designed. The total production for the year amounts to 383,020 lbs., assaying 959.1 ozs. per ton, a total of 183,682 ozs. of silver.

**Mill Ore.**—The production from this source was greatly increased, owing to the fact that a larger tonnage of payable ore existed in conjunction with the high-grade veins than was at first thought, and that better facilities for handling the tonnage were made, both underground and by the addition of bin capacity above. A small hoist and incline were installed for handling dump material. Of the 18,252 tons sent to the mill, 3,389 tons were taken from No. 7 dump.

The 18,252.3 tons milled averaged 29.29 ounces per ton, a total of 534,640.87 ounces silver.

**Classes of Ore.**—There was hoisted 33,738 tons of ore, classed as follows:

| | Tons |
|---|---|
| **Sacking Ore—** | |
| 1st Grade | 379 |
| 2nd Grade | 161 |
| Jig Conc. | 192 |
| Total | 732 |
| Mill Ore | 16,625 |
| Waste from bumping tables | 16,381 |
| Total | 33,738 |



**Kerr lake and Crown Reserve mines, Kerr lake, Ont.**

**Costs—**

The following were the costs:

43,134 tons rock hoisted at a mining cost of $5.07 per ton.

2,109,975 silver ounces at a mining cost of 10 38/100c. per oz.

**Draining Kerr Lake.**—During the year all preparations were completed towards dewatering the lake, in order to develop and stope the ore-bodies lying beneath it. This work was undertaken jointly with the Crown Reserve Mining Company, Limited. Hitherto, the workings have been stopped at a safe distance away from the bottom of the lake, as established by careful soundings, and, consequently, many good veins have not been developed to their full extent.

Surveys were started as early as the summer of 1912, and the full plans were worked out during the following winter. The application to dewater having been granted by the Government in the spring of this year, machinery was ordered, and the work of construction finished in August. The pumps were started on August 28th, and at the present writing the lake has been lowered several feet. At the rate the work is proceeding, it is safe to say that the bulk of the water will be out of the lake before the cold weather.

The plant in operation consists, briefly, of two pumping units of two centrifugal pumps each, the two units each driven by a 250 h.p. motor. The pumps and motors are mounted on a barge of some sixty tons capacity. The water is pumped against a head varying from 60 to 125 feet, through a twenty-inch pipe to Giroux lake, 2,700 feet distant. The rate of flow will average for the entire operation some 6,000 gallons a minute. The overflow from Giroux lake runs to the Montreal river. As the water in Kerr lake recedes, the barge is moved further out from the old shore line and new lengths of pipe connected.

It was originally calculated that between three and four hundred million gallons of liquid must be handled. As there are no inlets of importance in Kerr lake, it will be a simple matter, once the water is out, to keep it drained, and there will be no difficulty in recovering all of the ore hitherto considered unavailable, and of developing the undoubtedly valuable territory under the lake to its full extent.

As the Kerr Lake, Crown Reserve, and Cobalt Comet (Drummond) mines are dependent for their water supply on Kerr lake, a pumping plant has been installed on Giroux lake to supply them with water for all purposes. This plant consists of two motor-driven turbine pumps, each with a capacity of 500 gallons a minute, taking water from a well sunk in rock at the lake side, and connected to it by a blasted out passage. The water is pumped through an eight-inch pipe against 125 feet head to a 46,000-gallon receiving tank, whence it is piped to the different mines.

**Drummond Purchase**—Lots J. B. 9 and 10, containing about six acres under Kerr lake, together with 33 feet of the shore, recently purchased from the Drummond mine, jointly by this company and the Crown Reserve Mining Co., adds to the territory to be explored when the lake is drained, and offers very fair prospects of finding new ore. Part of this ground is in conglomerate formation, and there is one vein showing native silver, on the present lake shore.

**Ore Reserves.**—Estimates of this year are largely based on production figures as before, except that the Fleming vein, whose greater width and regularity makes such method feasible, has been carefully sampled, and the total value calculated from widths and assays in the usual manner. In this case no distinction is made between high-grade ore and mill rock. This year, no separation is made between available and unavailable ore since the latter will soon be available by the draining of the lake.

All ore estimated may be called positive.

The situation regarding possible ore is a little improved over last year, as prospects are very favourable for finding extensions of vein systems thrown open to development under the lake. Also there are very good indications that some ore will be found in the Fleming vein at least as deep as our present deepest level, the 275 ft. No attempt, however, is made to estimate possible ore.

Ore reserves have been decreased, but not to the extent that was expected, owing to better results from stoping, a more liberal allowance for mill ore in reserve, due to better recognition of its value and quantity from data gained during the year, and additions to the reserves in the Fleming and No. 23 vein systems.

Production for the year showed that the estimates of September 1st, 1912, were conservative, as the actual silver produced from high-grade ore exceeded by over 300,000 ozs. the estimated silver content of the ground

**View of Crown Reserve mine from Kerr lake mine**

removed. Of this excess, one-half has been allowed as an increase to the remaining reserves, and the other half used as a further factor of safety.

From lack of data, last year, mill ore reserves were given a very low value, which has been more than doubled from the year's production alone.

**Estimate of Ore Reserves, Kerr Lake Mine, Sept. 1st, 1913.**

| Big Chamber Vein System. | Estimated ozs. silver. |
|---|---|
| Big Chamber, Cross No. 11, Little McDonald | 567,700 |
| McDonald Vein | 753,900 |
| No. 7 Vein | 885,400 |
| No. 8 Vein | 66,000 |
| Main East Vein | 242,700 |
| Xmas Vein | 49,900 |
| No. 10 Vein | 1,073,300 |
| No. 15 Vein | 140,200 |
| Little No. 7 | 16,800 |
| Fleming Vein | 600,000 |
| Little No. 3 | 7,000 |
| Nos. 2, 21, 18, 20a | 6,400 |
| Nos. 23, 24, 25 | 25,000 |
| Total | 4,434,300 |
| Gain over estimated reserve 31st Aug., 1912 | 150,000 |
| Mill Ore | 700,000 |
| Dump Ore | 735,000 |
| Grand Total | *6,019,300 |

TREASURER'S REPORT.

The Treasurer, E. H. Westlake, says, in part:

**The shipments for the year** amounted to 2,160,878 ozs. The smelter settlements aggregate 1,977,870 ozs. The difference is accounted for by the deductions made by the smelting works for losses and in the way of treatment charges.

**The costs of production per ounce** are as follows:

| | Cents. |
|---|---|
| Mining and development cost | 10.38 |
| Shipment and treatment charges | 10.45 |
| Administration and general | 0.56 |
| Total | 21.39 |

The item "Mine Property" which at the beginning of the fiscal year stood at $55,000, has been increased to $130,000. The difference represents the purchase by the company of an undivided one-half interest in the 7-acre Drummond tract, which carried with it certain rights in connection with draining the lake.

All construction expenditures during the year have been charged to operating expense.

**Dividends Paid.**

The following is a statement of the dividends paid by the company to August 31st, 1913:

| | |
|---|---|
| In 1906 | $90,000.00 |
| 1907 | 210,000.00 |
| 1908 | 360,000.00 |
| 1909 | 480,000.00 |
| 1910 | 990,000.00 |
| 1911 | 1,200,000.00 |
| 1912 | 690,000.00 |
| 1913 | 600,000.00 |
| Total | $4,620,000.00 |

**Expenditures for the Fiscal Year 1912-1913.**

| | | |
|---|---|---|
| Cost of production and development: | | |
| Stoping | $18,710.10 | |
| Development | 29,036.81 | |
| Power, Light and Heat | 27,569.25 | |
| Ore Sorting and Jigging | 15,346.55 | |
| Tramming | 28,963.53 | |
| Hoisting | 8,060.02 | |
| Timbering | 17,011.79 | |
| Pumping | 760.33 | |
| Drills and Steel | 9,316.17 | |
| Mine Expense | 11,217.22 | |
| Repairs to Plant and Buildings | 5,950.31 | |
| Stable Expenses | 5,206.12 | |
| Office Expenses | 4,165.06 | |
| Surface Maintenance | 11,130.29 | |
| General Expenses | 989.55 | |
| Taxes | 24,780.00 | |
| Boarding House | 779.93 | |
| | | $218,993.03 |
| Shipment, treatment and other charges: | | |
| Shipment Expense | $1,349.24 | |
| Milling | 2,643.49 | |
| Freight | 9,323.65 | |
| Ore Treatment Expense | 92,632.61 | |
| Assaying | 4,891.22 | |
| Insurance | 3,608.95 | |
| | | 114,449.16 |
| Administration and general expenses | | 11,736.23 |
| | | $345,178.42 |
| Balance being profit carried to balance sheet | | 837,315.44 |
| | | $1,182,493.86 |

**Receipts for the Fiscal Year, 1912-1913.**

| | | |
|---|---|---|
| Proceeds of ore sales | $1,176,399.48 | |
| *Less—* | | |
| Ore on hand, at Smelter and in Transit 31st August, 1912, at estimated value | 205,262.18 | |
| | $971,137.30 | |
| *Plus—* | | |
| Ore on hand at, Smelter and in Transit 31st August, 1913, at estimated value | 192,989.09 | |
| | | $1,164,126.39 |
| Interest | | 18,367.47 |
| | | $1,182,493.86 |

## NORTH AMERICAN SMELTING CO.

A press despatch from Ottawa states that a case involving a charge of discrimination by the railways against eastern ore smelters in favour of those of British Columbia, was recently heard by the Dominion Railway Board. It is said to have arisen out of an application by the North American Smelting Co., of Kingston, Ont., for a reduction in the rates on lead and silver-lead ores from British Columbia to Ontario. It was stated on behalf of the Kingston works that the Canadian Pacific Railway, by charging a lower rate on refined lead and silver from the West, makes it impossible for owners of reduction works in the East to compete with the lead smelting and refining works at Trail, B.C. The Board will not give a decision in the matter until after owners of works in the West shall have had an opportunity to state their side of the case.

# COPPER MINING IN MICHIGAN

By Reginald E. Hore.

Michigan has long been known as an important producer of copper. The mines of the Lake Superior district are among the oldest regularly worked mines in America. One of them, the Tamarack, is the deepest in the world. Another, the Calumet and Hecla, is one of the largest in the world and has the distinction of having returned to shareholders over $120,000,000 in dividends. The Quincy mine from much leaner ore has yielded profits of over $20,000,000, and has a remarkable record for regularity in dividends.

Other well known Michigan copper mines which are or have been profitable, are the Ahmeek, Atlantic, Baltic, Central, Champion, Cliff, Copper Falls, Franklin, Kearsarge, Minesota, Mohawk, Osceola, Trimountain and Wolverine. Of these Atlantic, Central, Cliff, Copper Falls and Minesota have been worked out and abandoned. The old Franklin was nearly worked out, and then purchased by the Quincy Mining Company, which property it adjoined.

Taking the place of these idle mines and contributing largely to Michigan's production are the Allouez, Centennial, Superior, Franklin Junior, Isle Royale, Victoria, Mass and Lake mines. With the exception of the Superior and Lake these are all old mines, but have never paid dividends. The Allouez, Superior and Isle Royale are very likely to be the first to join the list of dividend payers. The costs at the others are comparatively high and their success or failure depends on very small fluctuations in the price of copper.

Besides the producing mines there are numerous properties on which exploratory or development work is being done. Few explorations prove profitable; but the prize being a large one, fortunes are spent in the endeavour to find another profitable deposit. It is noteworthy that of the forty properties on which work was being done in 1912, when the price of copper was unusually high, only 18 were in position to make large outputs, 13 operated during the year at a profit; but only nine were able to declare dividends. In the preceding four years copper averaged only 13.25 cents per pound, and only eight companies were able to declare dividends during that period.

Two two-man (Rand) machines Photo by O. Gardner

62nd level. Calumet conglomerate lode. Calumet and Hecla mine, Calumet, Mich.

The total dividends paid by these eight companies in 1911, when copper averaged 12.5 cents per pound, amounted to $5,351,125, and thirteen other companies were forced to levy assessments amounting to $2,086,-299 in order to continue operations.

In 1912, when copper averaged 16.5 cents per pound, nine companies paid $9,901,875, and the assessments levied totalled only $986,000.

The record of the producing companies is shown by the following table which, with other data given below, accompanied reports on the copper industry made by the writer for the Michigan Geological Survey:

**SUMMARY OF RESULTS OBTAINED IN 1908, 1909, 1910 AND 1911 BY THE 18 COPPER MINES WHICH PRODUCED OVER 90 PER CENT OF THE TOTAL OUTPUT OF MICHIGAN.**

| | | Tons ore stamped. | Cost of mining, transportation, stamping and taxes, per ton. | Pounds refined copper produced. | Pounds refined copper per ton of ore stamped. | Cost per pound at mine excluding construction. | Cost per pound smelting, freight, commission, eastern office. | Total cost per pound, copper. | Price received for copper sold. |
|---|---|---|---|---|---|---|---|---|---|
| 1. C. & H. All ore....... | 1911 | 2,909,972 | 1.84 | 74,130,977 | 25.47 | ..... | ..... | 8.52 | 12.82 |
| | 1910 | 2,795,514 | 1.92 | 72,059,545 | 25.77 | ..... | ..... | 8.96 | 13.20 |
| | 1909 | 2,842,880 | 1.93 | 80,095.995 | 28.18 | ..... | ..... | 8.28 | 13.61 |
| | 1908 | 2,643,938 | 2.15 | 82,549,979 | 31.22 | ..... | ..... | 9.00 | 13.62 |
| 2. C. & H. Conglomerate. | 1911 | 1,924,480 | 2.07 | 58,469,399 | 30.38 | ..... | ..... | 8.25 | 12.82 |
| | 1910 | 1,950,040 | 2.11 | 58,739,509 | 30.12 | ..... | ..... | 8.55 | 13.20 |
| | 1909 | 1,999,880 | 2.11 | 66,285,684 | 33.14 | ..... | ..... | 7.77 | 13.61 |
| | 1908 | 1,958,200 | 2.25 | 70,427,877 | 35.96 | ..... | ..... | 8.38 | 13.62 |
| 3. Tamarack. . . . . . . . . . . | 1911 | 392,338 | 2.69 | 7,494,077 | 19.1 | 14.07 | 1.23 | 15.56 | 12.71 |
| | 1910 | 525,554 | 2.67 | 11,063,606 | 21.1 | 12.66 | 1.30 | 14.70 | 12.97 |
| | 1909 | 689,099 | 2.44 | 13,533,207 | 19.6 | 12.41 | 1.18 | 14.30 | 13.32 |
| | 1908 | 654,894 | 2.57 | 12,806,127 | 19.6 | 13.14 | 1.36 | 15.24 | 13.39 |
| 4. C. & H. Amygdaloid. . | 1911 | 985,492 | 1.34 | 15,661,578 | 15.89 | ..... | ..... | 9.95 | 12.82 |
| | 1910 | 831,194 | 1.41 | 13,150,427 | 15.82 | ..... | ..... | 10.53 | 13.20 |
| | 1909 | 838,200 | 1.42 | 13,752,276 | 16.40 | ..... | ..... | 10.41 | 13.61 |
| | 1908 | 685,738 | 1.75 | 12,122,102 | 17.67 | ..... | ..... | 12.25 | 13.62 |
| 5. Osceola. . . . . . . . . . . . . | 1911 | 1,246,596 | 1.14 | 18,388,193 | 14.8 | 7.73 | 1.06 | 9.28 | 12.72 |
| | 1910 | 1,217,720 | 1.28 | 19,346,566 | 15.9 | 8.04 | 0.98 | 9.37 | 13.04 |
| | 1909 | 1,494,845 | 1.36 | 25,296,657 | 16.9 | 8.04 | 0.99 | 9.47 | 13.30 |
| | 1908 | 1,241,400 | 1.45 | 21,250,794 | 17.1 | 8.25 | 1.10 | 10.25 | 13.39 |
| 6. Ahmeek. . . . . . . . . . . . . | 1911 | 598,549 | 1.42 | 15,196,127 | 25.4 | 5.61 | 1.19 | 7.17 | 12.78 |
| | 1910 | 530,365 | 1.42 | 11,844,954 | 22.3 | 6.37 | 1.16 | 11.05 | 12.99 |
| | 1909 | 406,045 | 1.72 | 9,198,110 | 22.7 | 7.61 | 1.10 | 15.48 | 13.37 |
| | 1908 | 298,178 | 1.78 | 6,280,241 | 21.1 | 8.64 | 1.11 | 12.66 | 13.46 |
| 7. Allouez. . . . . . . . . . . . . | 1911 | 288,610 | 1.668 | 4,780,494 | 16.56 | 10.07 | 1.95 | 13.30 | 12.822 |
| | 1910 | 247,119 | 1.769 | 4,655,702 | 18.84 | 9.39 | 1.81 | 11.57 | 12.68 |
| | 1909 | 253,049 | 1.806 | 4,031,532 | 15.93 | 11.34 | 1.51 | 13.39 | 13.26 |
| | 1908 | 220,905 | 2.051 | 3,047,051 | 13.80 | 14.86 | 1.40 | 16.81 | 13.35 |
| 8. Wolverine . . . . . . | 1911-1912 | 401,308 | 1.58 | 9,408,960 | 23.45 | 6.75 | 0.836 | 7.586 | 14.10 |
| | 1910-1911 | 388,476 | 1.64 | 9,617,168 | 24.75 | 6.628 | 0.891 | 7.542 | 12.58 |
| | 1909-1910 | 390,837 | 1.61 | 9,757,101 | 24.96 | 6.453 | 0.93 | 7,413 | 13.24 |
| | 1908-1909 | 394,433 | 1.60 | 9,995,748 | 26.75 | 6,002 | 0.923 | 7.375 | 13.35 |
| 9. Mohawk. . . . . . . . . . . . . | 1911 | 802,548 | 1.406 | 12,091,056 | 15.07 | 9.33 | 0.81 | 10.399 | 12.63 |
| | 1910 | 902,537 | 1.43 | 11,412,066 | 14.22 | 10.076 | .889 | 11.44 | 13.09 |
| | 1909 | 819,019 | 1.40 | 11,248,474 | 13.73 | 10.22 | .875 | 11.21 | 13.20 |
| | 1908 | 685,823 | 1.44 | 10,295,881 | 15.01 | 9.60 | .938 | 10.75 | 13.43 |
| 10. Centennial. . . . . . . . . . | 1911 | 86,543 | 1.869 | 1,493,834 | 17.26 | 10.83 | 1.43 | 12.69 | 12.842 |
| | 1910 | 101,133 | 1,9477 | 1,572,566 | 15.40 | 12.65 | 1.49 | 14.48 | 13 12 |
| | 1909 | 196,525 | 1.818 | 2,583,193 | 13.15 | 13.82 | 1.56 | 15.61 | 13.28 |
| | 1908 | 169,693 | 2.086 | 2,196,377 | 12.94 | 16.12 | 1.63 | 18.49 | 13.39 |
| 11. Baltic. . . . . . . . . . . . . . | 1911 | 696,795 | 1.714 | 15,370,449 | 22.06 | ..... | ..... | 9.09 | 12.54 |
| | 1910 | 781,419 | 1.67 | 17,549,762 | 22.46 | ..... | ..... | 8.32 | 12.74 |
| | 1909 | 814,260 | 1.55 | 17,817,836 | 21.88 | ..... | ..... | 7.98 | 13.00 |
| | 1908 | 764,117 | 1.56 | 17,724,854 | 23.20 | ..... | ..... | 7.72 | 13.39 |
| 12. Champion. . . . . . . . . . . | 1911 | 734,392 | 1.743 | 15,639,426 | 21.296 | ..... | ..... | 9.63 | 12.54 |
| | 1910 | 722,051 | 1.86 | 19,224,174 | 26.62 | ..... | ..... | 7.85 | 12.74 |
| | 1909 | 753,908 | 1.80 | 18,005,071 | 23.88 | ..... | ..... | 8.45 | 13.00 |
| | 1908 | 794,703 | 1.62 | 17,786,763 | 22.38 | ..... | ..... | 8.34 | 13.39 |
| 13. Trimountain. . . . . . . . . | 1911 | 347,885 | 1.819 | 6,120,417 | 17.59 | ..... | ..... | 11.55 | 12.54 |
| | 1910 | 317,299 | 2.00 | 5,694,868 | 17.95 | ..... | ..... | 12.17 | 12.74 |
| | 1909 | 323,408 | 2.09 | 5,282,404 | 16.33 | ..... | ..... | 13.89 | 13.00 |
| | 1908 | 334,929 | 2.05 | 6,034,908 | 18.02 | ..... | ..... | 12.5 | 13.39 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14. Superior | 1911 | 162,599 | 2.39 | 3,236,233 | 19.90 | 12.01 | 2.02 | 15.31 | 12.652 |
| | 1910 | 140,514 | 2.69 | 3,181,041 | 22.64 | ..... | ..... | 14.29 | 12.63 |
| | 1909 | 81,641 | .... | 1,781,315 | 21.82 | ..... | ..... | ..... | 13.56 |
| | 1908 | 962 | .... | 21,244 | 22.08 | ..... | ..... | ..... | ..... |
| 15. Quincy | 1911 | 1,382,254 | .... | 22,252,943 | 16.1 | 9.25 | 0.89 | 10.62 | 12.725 |
| | 1910 | ........ | .... | 22,517,014 | ..... | 8.80 | 0.93 | 10.48 | 13.20 |
| | 1909 | ........ | .... | 22,511,984 | ..... | 8.85 | 0.91 | 10.52 | 13.40 |
| | 1908 | ........ | .... | 20,600,361 | ..... | 9.615 | 0.85 | 11.27 | 13.57 |
| 16. Franklin | 1911 | ........ | .... | 820,203 | ..... | ..... | ..... | ..... | 12.516 |
| | 1910 | 113,859 | .... | 966,353 | ..... | ..... | ..... | ..... | 13.33 |
| | 1909 | 170,456 | 1.94 | 1,615,556 | 9.47 | ..... | ..... | ..... | ..... |
| | 1908 | ........ | .... | ......... | ..... | ..... | ..... | ..... | ..... |
| 17. Isle Royale | 1911 | 457,440 | 1.42 | 7,490,120 | 16.4 | 8.97 | 1.21 | 10.85 | 12.38 |
| | 1910 | 520,860 | 1.42 | 7,567,399 | 14.5 | 9.75 | 1.26 | 11.84 | 12.68 |
| | 1909 | 401,280 | 1.87 | 5,719,056 | 14.3 | 13.12 | 1.44 | 16.64 | 13.00 |
| | 1908 | 218,940 | 2.33 | 3,011,664 | 13.8 | 16.91 | 1.99 | 28.99 | 13.29 |
| 18. Victoria | 1911 | 126,894 | .... | 1,303,331 | 10.3 | ..... | ..... | ..... | ..... |
| | 1910 | 122,497 | .... | 1,164,564 | ..... | ..... | ..... | 13.4 | 12.3 |
| | 1909 | 118,605 | .... | 1,062,218 | ..... | ..... | ..... | ..... | ..... |
| | 1908 | 109,015 | 1.51 | 1,290,040 | 11.18 | 12.366 | 1.97 | 14.335 | 13.10 |
| 19. Mass | 1911 | 73,475 | .... | 1,326,898 | 17.58 | ..... | ..... | ..... | 12.50 |
| | 1910 | 90,747 | .... | 1,321,885 | 14.59 | ..... | ..... | ..... | ..... |
| | 1909 | 139,404 | .... | ......... | 12.36 | ..... | ..... | ..... | ..... |
| | 1908 | 171,268 | .... | ......... | 10.31 | ..... | ..... | ..... | ..... |
| Total production (from U. S. G. S. Reports). | 1911 | 10,978,827 | .... | 219,840,201 | 20.0 | ..... | ..... | ..... | 13.7 |
| | 1910 | 10,869,561 | .... | 222,683,461 | 20.5 | ..... | ..... | ..... | 13.00 |
| | 1909 | 11,429,394 | .... | 234,136,529 | 20.5 | ..... | ..... | ..... | 12.7 |
| | 1908 | 10,531,271 | .... | 223,286,700 | 21.2 | ..... | ..... | ..... | 13.2 |

**A one-man (Leyner) machine** Photo by O. Gardner

**5th level. Osceola amygdaloid lode. Calumet and Hecla mine.**

**Recent Progress.**—The year 1912 was an unusually profitable one for Michigan copper mining companies and the companies made larger profits while paying higher wages than in previous years. The dividend-paying companies made larger disbursements than in 1911 and increased their surplus of assets. Large amounts were spent for construction and development work at the producing mines and more vigorous examination made of several properties that are not yet productive. Two new companies and one reorganized company began diamond drilling investigations that are expected to be continued over large acreages.

An unfortunate circumstance, and one most keenly felt by companies whose property is not centrally located, has been the scarcity of suitable labour. In spite of the increased wage offered, many of the companies, during the summer months especially, were unable to secure enough men to permit of very economical operation. This inability to run the mines at capacity prevented the owners from taking full advantage of good copper prices and increased the cost per ton produced. The increase in cost due to labour scarcity has been partially, but not wholly, offset by improvements in methods. Recently there has been more than ordinary attention paid to the improving of efficiency of all departments. New methods and machines and less waste of labour and supplies have materially decreased the cost of breaking and handling the ore underground. Labour saving devices have cut down the rock-house costs. New machinery installed at the mills gives a better recovery from the ore treated. Use of larger furnaces and more mechanical appliances to handle charge and furnace products has lowered the cost of smelting. In spite of the many improvements, the year 1912 showed higher costs per pound of copper produced. This, in most cases, at least, is due to higher wages paid, and means simply that the mine owners shared with the miners the profits of a successful year.

**Dividends.**—During 1912 the dividend-paying mining companies paid to shareholders $9,901,875, and added considerable amounts to surplus account. Ahmeek, Baltic, Calumet & Hecla, Champion, Mohawk, Osceola, Quincy, Trimountain and Wolverine all paid larger dividends than in 1911. Dividends paid for the past five years and to date have been as follows:

(To be continued)

Leyner drill. 9th level. Osceola amygdaloid lode Photo by O. Gardner

Calumet and Hecla Mine, Calumet, Mich.

## PORTFOLIO OF MINES

On June 1 The Canadian Mining Journal expressed the opinion that a British Columbia mining association had acted unwisely in beclouding the issue of a separate Portfolio of Mines at Ottawa by submitting the name of the member for Kootenay in the House of Commons for appointment as such Minister. A correspondent draws attention to a change in the attitude of the Nelson Daily News, a publication that for a while gave prominence to Mr. R. F. Green's name in connection with the proposed separate portfolio. Some weeks ago the Daily News said editorially: "The Daily News wants to be distinctly taken as advocating no special man for the position (of Minister of Mines). It believes Premier Borden can be trusted to make a suitable selection if such an appointment is decided on."

# CANADA'S NICKEL INDUSTRY

By Alex. Gray

(Continued from October 1st issue.)

### THE MOND COMPANY.

So much for the genesis and evolution of the nickel fields and the predominant partner in the nickel industry. Analysis of the data submitted in relation to the industry as a whole and the International Company in particular, invites the conclusion that both have attained to maturity. The industry certainly had no adolescent youth. It was at once an "ugly duckling." It was long in acquiring aplomb and in becoming a source of pride to its proprietors. If it was the despair of its earliest sponsors, it is ripe for the admiration of those who have a permanent interest in Canada's special mineral resources. That it was cradled in adversity, almost disowned by those whose natural heritage it is, practically discarded by domestic capitalists as unworthy of their serious considerations, rather emphasizes what has been achieved, accentuated as that success was by the recent increased capitalization of the respective producing companies and of other concerns in process of formation.

An insular view obtained, now and again, that an export duty on nickel large enough to be prohibitive almost—would be an effective method of averting war—more so than Peace preachments. As well might the constituents contained in ordinary explosives be made contraband. By adding to the armour of the God of Battle, by substituting a larger measure of immunity during naval conflicts, by increasing efficiency in the steel and allied arts, nickel—the nickel of Ontario—became indispensable. Local prejudice, because those who solved the metallurgy of these complex ores and created a world-wide demand for the refined metal without confiding in everybody, bulks small alongside of the avidity with which latter-day promoters seek to benefit from the research of the pioneer companies.

Within a year or two the law of national self-preservation, and the serenity with which the International and Mond Companies have expanded, pursued broader markets while perfecting plans to more fully supply those markets, resulted in the proving and pre-emption of nickel-bearing areas to an extent establishing Ontario as the future source of a metal the nations must have and the household arts will not be without. Whether or not the dream of the millennium, when warfare will become a matter for diplomatic or judicial arbitrament, is to be a reality, nickel will be more and more a utility removed from corrosive influences, essentially superior of itself or in alloy. Enough competition is extant and pending to preserve the equities in behalf of consumers.

It was the appreciation of all this that induced the Mond Nickel Company—properly to be designated as the junior partner to date in the nickel industry, to branch out with a new and modern smelter at Coniston near Sudbury, to acquire more properties in the Sudbury District, and to enlarge its metallurgical works at Clydach in Wales. Like the Canadian Copper Company, before it was merged into the International Nickel Company, and as the latter's shareholders experienced, the Mond Company can measure its success by contrast with its initial years of adversity.

The Mond carbon monoxide process in practice, differs from that of the International Company. Dr. Carl Langer and Dr. Ludwig Mond devised it and worked it out to a profitable fruition. In 1899 they sought the Sudbury fields and located there, at what was named the Victoria Mine. The year following the Mond Nickel Company was organized by Dr. Mond, the capital being £600,000. This company took over the Victoria Mine and smelter. In 1901 bessemer matte was produced, but delays ensued there and at the Clydach refining works. Several years elapsed before shareholders had a "look in." Of those years the writer of this review has this to say: "The first profit and loss statement was made up in 1903. Dr. Mond retained all of the deferred shares and many of the ordinary shares as part of the vendor consideration. Not only that, but for the first few years he met the dividend on the preferred shares; rather he made good all deficiencies. That his reward was worth waiting and working for, is evidenced by the fact that the deferred shares have drawn almost 200 per cent. in the five years ended April 30, 1910, the rate for each of the latter three years being 48 per cent. per annum. Yet Dr. Mond was no different from other scientists and capitalists who enlisted in the nickel business. 'It took longer'; as the Financial News of London remarked, 'to reach the dividend-paying stage than Dr. Mond had anticipated when the works were put up.' "

The Mond Company now is capitalized at £850,000, with £500,000 in 7 per cent. cumulative preference shares of £1 each; £300,000 in ordinary shares of £1, and £50,000 in deferred shares of £1 each. In the repayment of capital, the preferred shares, besides being entitled to the cumulative dividend of 7 per cent., have a priority of £7 10s. 0d. per share in the event of the distribution of assets. The ordinary shares have the right to a non-cumulative dividend of 7 per cent. per annum and one-half of the surplus profits, the deferred taking the other half.

After four years, in 1904-5, the ordinary shareholders received 6 per cent. In 1905-6 the ordinary shares paid 10 per cent. and the deferred shares 18. In 1906-7 the ordinary shares paid 12½ per cent. and the deferred shares 33. In 1907-8-9-10, the ordinary shares carried 15 per cent. and the deferred shares 48 per cent. In 1911 the ordinary rate was 16¼ per cent. and the deferred rate 55½ per cent. Otherwise arranged, the years 1909-11, inclusive, enabled the company to make this showing:

| | 1909. | 1910. | 1911. |
|---|---|---|---|
| Net profit | £111,320 | £114,107 | £140,803 |
| Balance after dividends | 23,053 | 22,763 | 42,399 |
| Brought in | 29,923 | 32,976 | 20,741 |
| For reserve, etc. | 52,976 | 55,741 | 63,140 |
| To reserve | 20,000 | 35,000 | 35,000 |
| Carried forward | 32,976 | 20,741 | 28,140 |

Having those figures, it remains to quote the remarks of Sir Alfred Mond, Bart., M.P., chairman of the company, at the annual meeting a year ago, when he dealt with the 1911-12 doings, that is, for the year ended April 30, 1912. He said:

> "I will deal with the balance-sheet first. If you look at the credit side there is an addition of £13,649 to the first item, namely, mines in Ontario (Canada), and freehold and leasehold land and houses in On-

tario and Clydach (South Wales). The bulk of this money has been spent on development in Canada and on some cottages at Clydach. In the next item, that is the smelting and refining works in Ontario and Clydach, the additions for the year amounted to £53,578. We are at present constructing new smelting works at Coniston, in Ontario, and this money has been spent on the construction of those works. The balance represents additions to our works at Clydach. The suspense account is always a fluctuating one, and has diminished by the sum of £5,000. Stocks on hand are some £14,000 up, while ore, raw material, and intermediate and finished products have increased by some £75,000. As our business increases we have to have larger amounts locked up in those items. Sundry debtors have increased by £19,000. The cash in hand shows an increase of £31,000, which is due to an instalment on the debenture stock paid in advance. As regards the debtor side of the balance-sheet, there is no alteration in the capital account. The first mortgage debenture stock, which we issued in the course of the last financial year, figures for the first time in our balance-sheet. The reserve fund, with the sum you voted last year, now stands at £185,000. The reserve suspense stands at £20,000, and your sundry creditors have increased by some £3,000.

"I will now deal with the profit and loss account. There was brought forward from last year £28,000, while the balance at credit for the financial year to April 30, 1912, is £154,364, which compares with £148,000, an increase of £6,000. The net outcome, in comparison with a year ago, is that the amount we have to deal with as profit is £13,200 more. I have very little to say about the balance-sheet. All the increases are in the ordinary course of our business, and the satisfactory item in it is the increase in the profit and loss account.

"Turning to the report of the directors, although the profits are somewhat higher the board have decided—and we have no doubt that the shareholders will agree—not to make an alteration in the amount of the distribution, but to leave the dividend at the same rate to which we raised it last year. Of the balance, we propose to place £15,000 to the ordinary reserve bringing the amount to £200,000, and to place £20,000 to the reserve suspense account, bringing its total amount to £40,000. We propose to carry forward the balance, namely, £41,381. This, I think, leaves our company, in a very sound position, and provides well for contingencies in the future. The progress of the operations of the company, both in Canada and in England, in spite of difficulties not due to internal causes, has been very satisfactory indeed.

"In consequence of the continuously-increasing demand for the metal we manufacture we have decided to enlarge our works in Wales. So far as our new smelting works, in Ontario are concerned, I am glad to be able to tell you, that, in spite of a winter of such exceptional severity that I believe nothing like it has been known in Canada for more than sixty years, the programme that was planned for the making of the railway tracks, laying of the concrete foundation, and of all the preliminary works, was carried out practically without a hitch. It was kept well up to time, and I think that the greatest credit is due to our Canadian staff, who succeeded in spite of temperatures which would alarm anyone in this country. The work is proceeding very well, and the latest reports are that the steel work of the different buildings is going up, and that there is every prospect of the new plant—which will be a very fine and entirely up-to-date smelter—being completed in the time contemplated.

"Our accounts from the mines as to developments are extremely satisfactory, and I think our shareholders have every reason to be satisfied. We, of course, are dependent for our profits to some extent on the fluctuations of the copper market, as we are not only producers of nickel metal, but also large manufacturers of copper sulphate. I am glad to say that although prices last year were above the very low levels reached in previous years, they are steadily improving, and if the present prices of copper are maintained we ought to benefit considerably in the course of the current financial year."

In the calendar year 1912 the Mond Company did not handle so large a tonnage as in 1911. According to the Ontario Bureau of Mines, 163,352 tons were raised in the latter year; 116,932 from the Garson mine, and 46,370 from the Victoria mine, as against a total tonnage raised in 1912, of 117,568. This falling off may have been due to the concentration of work upon the completion of the new Coniston smelter, the acquisition of other properties, the development of the Garson mine, and the shortage of ore at the Victoria. At any rate, the Mond people have their greater smelter in operation at Coniston and are fortifying themselves in the matter of ore supplies, having purchased the Worthington mine from its Montreal owners, found more ore at the Victoria, advanced the development of the Cochrane-McVittie property where there is a portion of "the great Frood deposit," as Dr. Coleman describes it, and otherwise provided for emergencies by buying ore from the Alexo mine near Kelso. With ore supplies assured and increased smelting and refining capacities in Ontario and at Clydach, the Mond Company may also take a considerable tonnage from the Murray mine, owned by the Canadian Nickel Corporation.

Its chief source of supply at present, is the Garson mine, near which the new and complete smelter is situated. A shaft is being sunk on the Cochrane-McVittie fraction. It will be sunk to a depth of 600 feet or so in order to tap the ore intersected by the drill, which drilling was done to determine whether this particular ground had any of the mass of ore as notified by the International Company's Frood or No. 3 mine adjoining.

That is why Dr. Coleman, already quoted, expects soon—to see this section "sending ore to the smelters of the two producing companies, and adding greatly t the available supply of the region." Power for the Coniston plant is obtained from Wahnapitae river. With the company's recent territorial acquisitions, including the Levack, Kirkwood and Blezard, the Mond will be removed from the shortage of ore with which it was confronted for a while.

*Canadian Nickel Corporation.*

The Mond Company having a stronger hold upon th source of supply and having insured the retention of its share of markets for its special products, rivalry to the chief producer is impending. Within the past few months the Canadian Nickel Corporation, Limited, was organized under the auspices of Dr. F. S. Pearson, of New York and London, counselled by consulting engineers, J. E. McAllister and Benjamin B. Lawrence, the capital being:

| | Authorized. | Issued. |
|---|---|---|
| 6% Debenture Stock | $10,000,00 | $10,000,000 |
| Common Stock | 20,000,000 | 20,000,000 |

In this allocation of capital provision is made for the redemption of the debenture stock at or under 106 by means of an annual sinking fund, payable out of earnings, which, it is expected, will enable the entire issue to be redeemed in twelve years, a further safeguard being set out that "the interest and sinking fund payments must be made before any dividends are declared on the common stock."

Prior to the formation of the Canadian Nickel Corporation, nearly all of the areas held by it were acquired by those interested in the Dominion Nickel Copper Company, chiefly Messrs. J. R. Booth and M. J. O'Brien, along with Messrs. Fadyen and Chapin; their managers at different periods being Mr. J. N. Glidden and Mr. J. A. Holmes, the latter being largely instrumental in arranging the deal with Dr. Pearson and his colleagues, with the sanction and cooperation of Mr. Booth.

It is the understanding that Mr. O'Brien would rather have dealt with Kirby Thomas, M.E., in behalf of the Messrs. Guggenheim, but Mr. Booth, in concert with Sir William Mackenzie, closed with Mr. McAllister, who represented the Pearson interests. As a consequence the Messrs. Guggenheim after having bid for it, declined to take the Worthington mine, which went to the Mond Company. Following is the initial memorandum prepared by the promoters of the Canadian Nickel Coporation. Its contents have not been made public until now when the financing plans are subjected to delay on account of monetary stringency in the world's banking centres:

"PROPERTIES.

"These cover approximately 17,500 acres in the Sudbury region—the most important source of the world's nickel supply—and include the following:

Murray, Elsie and Lady Violet Group,
Gertrude Group,
Whistle and Wild Cat Group,
Victor and Blue Lake Group,
Falconbridge Group,
Nickel Lake Group.

"From present development and prospecting work to May 1st, 1913, 6,800,000 tons of ore have been blocked out, or sufficient to operate on the basis of 1,500 tons of ore daily for almost thirteen years, while the engineers estimate that the properties contain at least a further equal amount.

"POWER AND TRANSPORTATION.

"Hydro-electric power is obtainable at from $12 to $16 per horse power per annum from two companies generating power in the district. The Canadian Nickel Corporation, however, proposes to generate its own hydraulic power and to install two units of 5,000 kilowatts each, thereby reducing the cost below the above figures.

"Excellent transportation and shipping facilities are available as three railway lines serve the property, namely, Canadian Northern, Canadian Pacific, and Algoma Eastern Railway.

"REFINING.

"The rights to a refining process (which has been in successful operation in Norway for the past three years) for all nickel ore mined in North America, have been secured, after full and satisfactory investigation as to its merits by four different experts.

"The sheet nickel and copper produced under this method are ninety-nine per cent. fine and the form in which nickel is turned out by this process has in the past commanded a price of five cents per pound more than nickel not refined electrolytically.

"MANAGEMENT.

"The operations of the company will be in the hands of the managing director, Mr. J. E. McAllister, who for the past ten years has been in active charge of successful metallurgical enterprises of this type. His experience and record, not only as an engineer, but in the successful application of technical knowledge to industrial business, especially qualify him to fill this important position. The heads of departments have been selected from men who have either been associated with him in the past or who are specially fitted, by knowledge and experience, to conduct the work of each branch.

"ESTIMATED EARNINGS.

"The operating department of the corporation estimates a total cost per ton, of $6.60; this allowing for contingencies and including all expenditure from ore in place to the sale of the contained metals. Operations are to be conducted upon a basis of 540,000 tons of ore per annum, from which will be extracted an average of 30 pounds of nickel, 12 pounds of copper, and $1.00 in precious metals per ton.

"The American quotations for electrolytically refined nickel have ranged from 45 cents to 50 cents per pound for the past two years (see United States Government Reports, also 'Engineering and Mining Journal' quotations), but assuming a price of 30 cents per pound for nickel and 13 cents per pound for copper, the following earning basis will result:

| | | |
|---|---|---|
| Nickel, 30 lbs. at 30 cents | 9.00 | |
| Copper, 12 lbs. at 13 cents | 1.56 | |
| Precious metals | 1.00 | |
| | $11.56 | |
| Deduct operating costs | 6.60 | |
| Net profit per ton of ore | $4.96 | |
| Net profit per annum, 540,000 tons at $4.96 $2,678,400. | | |
| Deduct 6% interest on $10,000,000 Debenture Stock | $600,000 | |
| Annual Sinking Fund, say | 600,000 | |
| | | $1,200,000 |
| Balance available for $20,000,000 Common Stock (or about 7½%) | | 1,478,400 |

"DIRECTORS.

"Dr. F. S. Pearson, M.I.C.E., President, President of Brazilian Traction, Light & Power Co.; J. Frater Taylor, Vice-President, Managing Director Lake Superior Corporation; J. E. McAllister, Vice-President and Managing Director; Benjamin B. Lawrence, Consulting Engineer, New York; E. R. Wood, Director Canadian Bank of Commerce; Walter Gow, Director Brazilian Traction, Light & Power Co., Miller Lash, Director Mexican Light & Power Company."

The foregoing may be accepted as the general purpose of the influential promoters, who expect to market the metallic contents of 540,000 tons of lower grade ore than has been treated by other companies—and to do it at a handsome profit with the Hybinette process. Of course the item "precious metals" is something new in the per ton profit on these ores, but if the world will take all the nickel necessary to carry the capital of the three producing companies, Canada cannot complain and will welcome the momentum. Perhaps it should here be reiterated that the International Company has no fixed charges; nor are the debentures of the Canadian Nickel Corporation designed to be a burden in case of a struggle for markets. With the Canadian Nickel Corporation it becomes a matter of internal economics and ability to assert in the nickel trade. In this connection Dr. Coleman, who visited Norway in 1911, has this to say encouragingly with reference to what Messrs. Hybinette, Borthen and Henriksen are doing there with ores similar in character to those of the Sudbury District:

"Mr. Hybinette states that the cost of mining the Evje ore is $1.25 per ton, and that the smelting to low grade matte amounts to about as much; but that the second smelting costs about $20 per ton of high grade matte. One hundred men are employed at the mine and as many at the smelter.

"The little establishment at Evje is interesting as a contrast with the great smelting plants at Copper Cliff and Coniston; and it is rather surprising to find so modest a plant with such simple methods able to compete successfully with these large, costly and highly organized enterprises.

"The high grade matte is shipped by narrow gauge railway to Kristiansands, the seaport at the end of the valley, to the refining plant which is under the charge of Mr. V. Hybinette. The works, which are a little west of the city, have been in operation for over a year and have been so successful that plans are under way for a large increase in the plant. I am under obligations to Mr. Hybinette for taking me through the works and explaining the process, which is in accordance with United States patents No. 805,550 and No. 805,969, taken out in 1895, and first used in the plant in the Southern States (Missouri) and now owned by the Dominion Nickel Copper Company. As this electrolytic process is described in the patents, it will be unnecessary to refer to its features in detail at this point.

"At the time of my visit—June, 1911, about one ton of nickel was produced a day, having a composition as follows:

| | |
|---|---|
| Nickel | 98.70% |
| Copper | 0.07% |
| Iron | 0.63% |
| Sulphur | 0.02% |
| Arsenic | 0.05% |
| Cobalt | 0.90% |

"In a general way it may be said that the matte is roasted to convert the metals into oxides, then leached with weak sulphuric acid, which extracts principally the copper. The residue is heated with sulphuric acid in a temperature at which hydrous sulphates do not exist, and is again leached with weak sulphuric acid to extract copper. The residue is then heated with hydrochloric acid to a temperature sufficiently high for partial decomposition of the anhydrous chlorides and again leached with weak acid, the heatings being repeated, if necessary, in order to obtain a residue of nickel oxide suitable for further treatment."

These generalizations bearing on the Hybinette process are specially apt, since the process has been a controversial issue in the Canadian nickel country. They are more so now, in view of the advent of the Canadian Nickel Corporation, for which Mr. O'Brien bought the rights some years ago. The process has been employed at Norway for about three years and the promoters of the Canadian Nickel Corporation in their prospectus leave no room to doubt its feasibility in Sudbury District practice, notwithstanding the lower percentages, of the nickel-copper and copper, as compared with the grade of ore heretofore treated by the International and Mond Companies. On this point Mr. J. E. McAllister has reported:

"REFINING AND SEPARATION OF THE METALS.

"For this purpose the process which has been in use for more than two years past by A. S. Kristiansands, Nikel-raffineringsvork, at Kristiansands, Norway, has been adopted, the rights for its use having been purchased for all ore mined on the Continent of North America. By this process the nickel and copper are separated by electrolysis; the precious metals, chiefly platinum and gold, being recovered from the tank residues. The commercial success of the process has been fully demonstrated by the operations in Norway, and in the investigation of it the writer has had the assistance of Messrs. R. W. Deacon and C. S. Lomax, of New York, and W. A. Heywood, of London.

"The investigation of the technical and commercial work of the process has been exhaustive and satisfactory, the engineers referred to, as well as the writer, having spent some time at the Norwegian plant for this purpose.

"Its working costs have been considered over a period of two years, from which estimates have been compiled for the operation of the process in Canada under conditions which obtain there. The sheet nickel and copper are 99 per cent. fine, and the form in which the nickel is turned out has in the past commanded a price of 5 cents per pound more than the market quotations of nickel which is not refined electrolytically."

"OPERATING COSTS AND REVENUE.

"The ore blocked out by prospecting and development operations to May 1st, 1912, amounts to 6,800,000 tons, as follows:

| | |
|---|---|
| Whistle and Wild Cat mines | 1,400,000 tons. |
| Murray and Elsie mines | 4,665,000 tons. |
| Nickel Lake, Gertrude, etc. | 735,000 tons. |
| | 6,800,000 tons. |

"In addition, there is a large tonnage of lower-grade ore in the Whistle and Wild Cat property, and the company has also in the Falconbridge property 2,500,000 of lower-grade ore, but as this will not be available until suitable means of mechanical concentration is adopted, it is not taken account of in the figures which follow. Its possibilities, however, must not be lost sight of.

"The average contents of the 6,800,000 tons specified above will be 51.31 lbs. of combined nickel and copper and $1.15 precious metals (platinum, gold and silver) per ton of ore, from which will be extracted 30 lbs. of nickel, 12 lbs. of copper and $1 in precious metals. It is intended that operations shall be conducted upon a basis of the delivery of 45,000 tons of ore monthly to the reduction works, or 540,000 tons per annum, and at this capacity the total expenditure to cover all operations is estimated not to exceed $6.60 per ton of ore handled."

(To be continued.)

# SYDNEY COAL FIELD*

By G. A. Young.

The name, Sydney coal field, is applied to the area of Carboniferous strata fringing the north-eastern coast of Cape Breton for above 30 miles from Cape Dauphin on the west, to Mira Bay on the east. The area occupied by these measures amounts to about 300 square miles, of which total about 50 square miles is underlain by the Productive Coal Measures. In addition to the land area of the Productive Coal Measures, there is, by reason of the low seaward dip of the strata, a very considerable submarine area from which coal may be won.

The Sydney Carboniferous basin is notable for the splendid sections exposed along the coast and for the great thickness of the strata, which, in the vicinity of Sydney harbour, reaches approximately 12,600 feet. The section is characterized by the apparent absence of pronounced stratigraphical breaks. In general, the geological structure is simple in form, the angles of dip low, and although a few prominent faults occur, the greater part of the field is free from them.

By reason of a series of low folds and certain indentations of the coast, the coal field is naturally divisible into six coal basins or districts. All of these with but one exception contain, besides a number of minor seams, 5 to 8 seams of coal varying from 2 feet to 13 feet in thickness. The total thickness of coal in seams that may be workable varies in the five main basins from 23 feet up to 47 feet. The coal is of a bituminous variety and in 1911 the total production amounted to above 4,900,000 tons. The individual seams are traceable for miles along the strike, in fact many of them are believed to extend throughout the whole length of the field. The individual seams vary somewhat in quality along the strike, change in thickness in a rather remarkable manner, and in some cases what is one seam in one locality becomes two in another, because of the greatly increased thickness of an elsewhere relatively insignificant parting.

The fund of general geological information concerning the Sydney Carboniferous area is contained, almost entirely, in early reports by Charles Robb and Hugh Fletcher, published by the Geological Survey in the '70s, and in a series of maps by Fletcher which are, in part, revisions of earlier editions. Important contributions to the geology of the district were made by Richard Brown, at one time manager of a coal company operating in the field. The varied and striking palæobotanical material described by Bunbury and Dawson was mainly collected by Brown, chiefly from the North Sydney area and in no small part from one shale bed overlying the main seam. From this single horizon, it is stated by Brown, that over 90 plant species were obtained.

The Carboniferous strata of the district have been grouped and mapped under four divisions, of which the highest, the Productive Coal Measures, embraces the youngest consolidated rocks in the region. The different divisions, in a general way, are displayed over long areas trending east and west, parallel to the coast line—the highest divisions bordering the coast, the lower divisions developed inland towards the south and resting on Cambrian and Pre-Cambrian strata. The Pre-Cambrian comprises plutonic, volcanic, and highly metamorphosed sedimentary strata; the Cambrian is mainly of sediments which are in part fossiliferous.

The Carboniferous area, bordered on the north and east by the Atlantic, is essentially a low, rolling country, seldom rising higher than 350 feet above the sea, while the Pre Cambrian and Cambrian areas, situated to the south and west, are more broken, and in part consist of long ranges of high hills rising abruptly from partly encircling Carboniferous lowlands, to heights of from 500 to 1,000 feet above sea level. The coast line is broken by bays and channels of the sea running inland in a south-westerly direction. One of the larger of these indentations is that of Sydney harbour, situated towards the centre of the basin and forking towards its head into two arms, each of which is continued inland by a long valley. Farther west, cutting through the Carboniferous lowland, are two long channels leading south-westward into the salt water Bras d'Or Lake, which occupies so much of the central part of Cape Breton Island.

The general south-westerly trend of the depressions occupied by the sea, of the courses of the axes of folds in the Carboniferous, and of the high ranges of Pre-Cambrian and Cambrian strata, is a marked feature. The presence of the Carboniferous over the lowlands that border and penetrate the high hills of Pre-Cambrian and Cambrian rocks, the overlapping of various divisions of the Carboniferous on these ancient strata, the relatively undisturbed attitude and the comparatively coarse nature of the bulk of the thick series of Carboniferous measures are signs which point to the conclusion that the topography of the present day in some measure reflects that of early Carboniferous time.

The nearness to the old shore of the portion of the Carboniferous basin still preserved doubtless, in part at least, explains the great volume and general characters of the sediments. Possibly a considerable proportion of the supposed thickness may be explained as due to dip of deposition.

The general similarity of the Carboniferous measures as displayed in Cape Breton, to those on the mainland of Nova Scotia and over New Brunswick, along the southern and western edge of the Gulf of St. Lawrence; the resemblance of these beds to those developed in Newfoundland on the east side of the St. Lawrence Gulf; and the occurrence of Carboniferous strata on the Magdalen Islands, situated towards the centre of the hydrographic basin, have led various observers to believe that Sydney Carboniferous area represents a remnant of the southern border of a once continuous basin of Carboniferous strata that may have occupied the greater part of the area of the Gulf of St. Lawrence.

The Carboniferous section of the Sydney field is customarily divided into the following groups, tabulated in descending order with approximate thickness as developed in the vicinity of Sydney harbour.

| | |
|---|---|
| Productive Coal Measures ........ | 1,970 ft. |
| Millstone Grit .................. | 3,625 ft. |
| Limestone series ................ | 4,500 ft. |
| Conglomerate series ............. | 2,525 ft. |
| Total. ...................... | 12,620 ft. |

The Conglomerate series consists essentially of red conglomerates, sandstones and shales. The conglomerates predominate and their water-worn pebbles and boulders are often of large size. Calcareous material in

*Extracts from Guide Book No. 1, published by the Geological Survey for the Twelfth International Geological Congress, August, 1913.

places forms the matrix of the conglomerates and occasional impure beds of limestone occur.

The Limestone series includes a great thickness of sandstone and shales, red and grey or green in colour, also conglomerate horizons, and many beds of limestone that frequently are fossiliferous. Only one bed of gypsum is known to occur in this series in the neighbourhood of Sydney harbour, though a few miles to the west and in other areas of the Carboniferous, gypsum forms an important member of the series.

The Millstone Grit is largely composed of coarse and fine, grey or green sandstones in part conglomeratic, especially towards the base of the series, and shales usually dark in colour. In the eastern part of the field shales are relatively more abundant, are more largely red, and at least one important coal seam is present, whereas, to the west the shales are generally dark, are less abundant, the conglomeratic phases of the sandstone are more prominent and coal seams are absent or relatively unimportant.

The Productive Coal Measures are largely shales, commonly dark coloured, but also in part red or green, and light coloured sandstones. Thin, persistent beds of dark limestone form a characteristic feature of the lower portion of the division. In various measured sections there is, on an average, 24 coal seams, with a total average thickness of 46 feet of coal.

## ALLIS-CHALMERS MANUFACTURING COMPANY'S PULVERATOR.

The Allis-Chalmers Pulverator is a crushing and pulverizing machine designed on a new principle. It might be thought, at first glance, to resemble the ordinary hammer mill but differs essentially in its action, as will be seen from the explanation given below.

The Pulverator is small, compact and easily mounted on a light foundation on account of its being evenly balanced.

It is designed as a crusher for the reduction of material from 3 inches or finer to a size of which all will pass a 20-mesh screen if necessary. The materials which it handles to advantage include limestone for cement making, concrete, agricultural purposes, etc., coal shale, feldspar, phosphate rock, gypsum, bauxite, slag and similar substances.

The machine can be regulated so as to provide for a 1 inch product down to any size desired, as low as 20-mesh, and on materials not too abrasive a product even finer than 20-mesh may be obtained. When a machine is crushing 20-mesh material there is a large quantity of the output much finer than this size and tests made on ordinary limestones indicate that from 40 per cent. to 50 per cent. of the product passes 100-mesh.

The capacity is proportional to the size of the product and the character of the feed. It varies from 5 to 7 tons an hour up to 15 tons, with consumption of a corresponding amount of powers, ranging from 25 to 40 h.p. for the outputs mentioned.

The wear is entirely upon the hammers, the lining plates and the grate bars, all of which are easily renewable.

The material is fed into the machine by a feeder or feed spout located in one of the upper corners and is immediately struck upward by one of the swiftly revolving hammers. It is thrown against the involute surface of the liners, which are set at such an angle that the material re-bounds and is again struck by the hammers, this action being repeated until the material is finely pulverized. The fine material is carried forward by the air currents and passes out between the involute liners or grate bars in the bottom of the casing. The hammers revolve very rapidly and are sufficiently heavy to produce a very effective blow even on a large lump of material.

The top and sides of the casing are protected by involute liners made of hard cast iron and are held in place by means of countersunk head bolts. Involute grate bars, set concentric with the line of travel of the hammers, form the bottom of the crushing chamber. These bars or liners are placed from ⅝ inch to 1 inch apart, the distance depending upon the nature of the material to be crushed, and the finished material is thus permitted to pass out between them. The grate bars slip into grooves in the casing and rest against each other.

Where the material to be crushed is inclined to pack in the machine the ordinary grate bars, similar to those generally used on a hammer mill, are employed instead of the involute type.

The shaft is carried in heavy ring oiling dustproof bearings located on the outside of the casing. The driving pulley is placed on this shaft outside of one of the bearings, and the flywheel is similarly placed on the opposite side.

A solid cast steel centre, which has a circular flange or disc on each end, is mounted on the revolving shaft and the "U" shaped hammers are attached to these discs by means of suitable pins.

The hammers are made in three pieces. The two side pieces which are fastened to the disc by a heavy pin, as explained above, screw into the shoe or wearing part of the hammer, which is made of special tool steel. The side pieces of the hammers are made in pairs of three different lengths, hammers of equal length being placed diametrically opposite each other. The shoes or wearing parts are made in three different thicknesses so that as the hammers become worn the thinnest one may be removed and the two remaining sets moved up to the next longer side pieces and a new shoe placed upon the first set of side pieces. It will readily be seen that this arrangement will greatly increase the life of the hammers and consequently reduce the cost of repairs.

The feeder has been specially designed for this mill and incorporates the well-known principle of the Gates feeder. It is adjustable within a wide range by means of a slotted crank. The crank on the sprocket or pulley provides a rapid and convenient means of stopping for adjustment. The power to operate the feeder is taken from the shaft near the balance wheel. This feeder is so arranged that the operator can at all times see just what material is being fed to the pulverator.

## GRANBY CO.'S NEW SMELTER.

Mr. F. M. Sylvester, assistant to the general manager of the Granby Consolidated Mining, Smelting & Power Co., Ltd., returned to Spokane, Washington, on September 27 after having spent several weeks at Granby Bay, Observatory Inlet, B.C., where the company is putting in a 2,000-ton smelting plant. He said that although rain had fallen every day for three weeks, there had not been any serious interruption to construction or equipment work on the new smeltery and hydro-electric power system. The buildings for both smelter and power plant are nearing completion. Practically all the machinery and other equipment has been received at Granby Bay, and much of it put in place. Altogether, both construction and installation have been advanced to a stage that promises the early completion of the works, so that it is expected ore-production and smelting operations will be commenced early in 1914.

## MINING EXPOSITION AT PHILADELPHIA.

The First National Mining Exposition, to be given in Philadelphia, October 17 to 25, under the auspices of the American Mining Congress, has gone far beyond the expectation of its promoters. Conceived but three months ago, its artistic and business success were assured fully a month ago. Now it promises to be one of the greatest trade gatherings ever held in this country and will undoubtedly result in great good to the industry.

"The response made by the mining men of the United States to the call for this Exposition," said Richard L. Humphrey, director of the Exposition, "only serves to indicate what a real need there has been existing for such an Exposition. It was quickly realized that this would not be merely a show for the curious, with doubtful results to the exhibitors. The American Mining Congress, which is to hold its convention at the same time, will bring to Philadelphia more than 2,000 of the leading mining men of the country, and these will attend the Exposition in addition to the men who will come solely for the Exposition. Considering the short time that the Exposition has been under way, I believe that it will be a most remarkable show."

A number of the exhibitors and their exhibits are as follows: Westinghouse Electric & Mfg. Co., Pittsburg, and Baldwin Locomotive Company, Philadelphia, mine locomotives; Western Electric Company, New York, mine telephones; Milwaukee Locomotive Company, Milwaukee, Wis., gasoline mine locomotives; Universal Portland Cement Company, Chicago, Ill.; use of cement in mining; Streeter-Amet Weighing & Recording Company, Chicago, automatic weight recorder for mine tipple scales; the Lobdell Wheel Car Company, Wilmington, Del., car wheels and axles as applied to mining cars; J. S. McChesney & Company, Chicago, mine supplies; Williams Patent Crusher & Pulverizer Company, Chicago, a coal crusher; Atlantic Refining Company, Philadelphia, lubricating oils; Hirsch Electric Mine Lamp Company, Philadelphia, miner's cap and lamp; Henry Troemner, Philadelphia, assay and analytical balances; West Virginia Rail Company, Huntington, W. Va., steel rails; Keuffel & Esser Co., Hoboken, N.J., mathematical and surveying instruments; C. O. Bartlett & Snow Co., Cleveland, O., working model of a complete coal handling plant; American Tempering Company, Springfield, Ill., a system of welding; Hyatt Roller Bearing Company, Newark, N.J., mine car wheels with roller bearings; Roessler & Hasslacher Chemical Co., New York, the sodium compounds used in mining; Link Belt Company, Chicago, elevating, conveying and transmission machinery; Fairmont Mining Machinery Company, Fairmont, W. Va., portable electric mine pump, etc.; Draeger Oxygen Apparatus Company, Pittsburg, Pa., life saving apparatus; General Electric Company, Schenectady, N.Y., electric machinery and appliances; Jeffrey Manufacturing Company, Columbus, Ohio, storage battery locomotive, etc.; John A. Roebling's Sons Company, Trenton, N.J., wire ropes and cables; the Alexander Milburn Company, Baltimore, Md., carbide lamps, etc.; Main Belting Company, Philadelphia, belting; Electric Storage Battery Company, Philadelphia, storage batteries designed for mine locomotives; Goodman Manufacturing Co., coal mining machinery; John G. Scott, Girardsville, Pa., patented transmission rope clip; Edison Storage Battery Co., Orange, N.J., storage batteries and electric mine lamps.

In addition to the above, there are twenty or more representative mining concerns that are just closing up negotiations for space in the Exposition. This, it is expected, will make the First National Mining Exposition a wonderful success.

## HOLLINGER.

The report for the period of four weeks ending September 9, 1913, shows a gross profit of $145,866.79. Operating costs were $61,899.48, an average of $5.179 per ton of ore milled. The approximate average value of all ore hoisted was $17.94. 6,033 tons of the ore was from development work, and 6,363 tons from stopes.

The mill treated 12,264 tons of ore of which 311 tons were treated for Acme Gold Mines, Ltd. The average value of the ore treated was $17.80. The average milling cost was $1.376 per ton. Approximate extraction was 96.4 per cent.

Work upon No. 1 vein upon the 425 ft. level is demonstrating that values and widths are about the same as upon the upper levels, and preparations are being made to immediately start sinking to the 550 feet level.

A point of interest to be noted is that practically one-half of the ore milled came from development work.

The main shaft has been holed through from the 300 to the 200 ft. level and is being timbered.

Crosscutting upon the 100 feet level resulted in finding an ore body which shows the same characteristics and high values as does No. 1 vein. The crosscut caught the vein 250 feet north of the supposed northern extremity of No. 1 vein, and as the new ore body lies directly ahead of the old workings it is possible that No. 1 vein may have a greater length than had previously been supposed.

Upon the 300 ft. level an ore body has been picked up by crosscutting which would appear to be No. 8 vein.

The reduction of working cost to $5.18 per ton is the lowest figure yet reached.

## NEW ROTARY POWER PUMP.

A new type of rotary power pump has just been developed by the Goulds Ffg. Co., Seneca Falls, N.Y.. This pump differs from the rest of the line of pumps of the same capacity in that gear style cams have been substituted for the three-toed cams used in the remainder of the line, and the gears on the end of the cam shafts have been eliminated.

Two sizes are built: No. 1 has a capacity of 25 to 50 gallons per minute at 225 to 450 revolutions, and No. 2 has a capacity of 50 to 100 gallons per minute at 225 to 450 revolutions. Both pumps are suitable for pressures up to 100 pounds or 230 feet elevation.

They are mounted on a cast iron bed plate, fitted with an outboard, bearing and tight and loose pulleys for belt drive. The suction connection is made within the base directly beneath the case and is reached through hand holes in the base. No. 1 has two discharge openings, one tapped for pipe and the other threaded for hose couplings. No. 2 has three discharge openings, two fitted the same as No. 1, and the third fitted with an interchangeable blank flange.

The suction is 3-inch on No. 1 and 4-inch on No. 2. The discharges are for 1½ and 2-inch pipe or hose respectively.

The Goulds line of pumps are for sale in Canada by the Canadian Fairbanks-Morse Co., Limited.

# PERSONAL AND GENERAL

Mr. John P. Clarke, B.A., a graduate of Queen's, Kingston, while employed with a survey party in the Flathead country, Southeast Kootenay, British Columbia, was killed by a tree falling on him and crushing his skull.

Dr. Alfred W. G. Wilson, of the Mines Branch of the Canada Department of Mines, after his return to British Columbia from a trip to Yukon with Excursion C8 of the International Geological Congress, has been making investigations relative to the question of the appointment of a special commission asked for by some members of Kootenay Boards of Trade to enquire into matters connected with the lead and zinc mining industries.

Mr. Cosmo T. Cartwright, assistant engineer, Division of Mineral Resources and Statistics, Mines Branch of the Canada Department of Mines, has been in British Columbia lately, gathering additional information concerning the mining and metallurgical industries of that Province.

Mr. Wm. Watson, for some time manager for the Motherlode Sheep Creek Mining Co., operating a gold mine and stamp mill in Nelson mining division, B.C., has returned to Nelson from a visit to Chicago.

Mr. Jas. McEvoy, who was taken ill with pneumonia while travelling in British Columbia with the C2 Excursion of the International Geological Congress, and had to be placed in a hospital in Vancouver for a time, is now recovered and has returned to Toronto.

Mr. M. K. Rodgers, well-known in British Columbia in connection with the development of the Nickel Plate group of gold mines in Camp Hedley, Similkameen district, and the Hidden Creek copper mines near Observatory Inlet, has lately been revisiting those properties, the great value of which he was the first to recognize and demonstrate by development of large bodies of ore. He had been in Mexico for a year or more previous to his recent return north. As he still holds mining property in Mexico, he intends making Los Angeles, Southern California, his headquarters in the near future.

Mr. Desaix B. Myers, of Los Angeles, California, has been examining the Emerald lead mine, near Salmo, Nelson mining division, B.C.

Mr. Frederick P. Burrall, of New York City, has been investigating mining conditions in the White Bear country, Yukon Territory, and across the International Boundary line from that region, in the Shushanna gold field, Alaska.

M. Eriera de Castro, a Portugese mining engineer, recently accompanied Mr. W. E. Cory, of New York, formerly president of the United States Steel Corporation, now one of the largest shareholders in the Hedley Gold Mining Co., and Mr. J. B. Worden, of Philadelphia, on a visit to the Hedley Co.'s Nickel Plate group of gold mines and 40-stamp mill in Camp Hedley, Similkameen, B.C.

Mr. Chas. Camsell, of the Geological Survey of Canada, whose lengthy memoir on the "Geology and Ore Deposits of Hedley Mining District, British Columbia," was published in 1910 by the Canada Department of mines, lately paid another visit to the Nickel Plate mines to obtain additional geological and mineralogical data made available by the extensive underground development work done since his report on the district was prepared.

Mr. C. H. McDougall, superintendent of the Consolidated Mining & Smelting Co.'s St. Eugene and Sullivan Group lead-silver mines in East Kootenay, B.C., was ill in the hospital at Cranbrook during the latter part of September. Latest news was that he was recovering.

Mr. S. J. Schofield, of the Geological Survey of Canada, with his field party, last month went up Crawford Creek from Kootenay Lake to cross the mountain divide between West and East Kootenay, in which latter part of British Columbia he has done much geological work in recent years.

Mr. L. B. Reynolds has returned to Nelson, B.C., after having spent two or three months in the Eastern United States.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was a visitor to Spokane, Washington, U.S.A., during the "Inland Empire Fair" week in that city in the latter part of September.

Mr. J. L. Warner, who several years ago was instrumental in attracting public attention to promising gold mining properties in Sheep Creek camp, Nelson mining division, B.C., and of late has been giving his attention to the South Belt of Rossland camp, in the same Province, was married last month in Spokane, Washington, and now has his home in Rossland.

Mr. John Hopp, of Barkerville, who has for years been operating on a comparatively large scale, hydraulic placer-gold mines in Cariboo district, B.C., was in Victoria last month seeking an injunction to prevent interference with his Lowhee water ditch. Last summer the manager of the neighbouring mining property was sent to jail for having blown up part of the Lowhee ditch with dynamite; latterly gates have been surreptitiously opened on different occasions and the water run to waste, so as to prevent Mr. Hopp from using it in washing gold-bearing gravel.

Mr. E. S. Moore was in Toronto on October 1st on returning from a trip to the Yukon.

Mr. Roy Margeneau has joined the staff of the Tough-Oakes Mining Company at Kirkland Lake, Ont.

Messrs. Weigand, Schenk, Morel, Fermor, Luttman-Johnson, Mouye and Zoude Mrs. Fermor and Miss Raisin, members of the International Geological Congress, visited Porcupine and Cobalt last week. Mr. R. G. McConnell was in charge of the party. Mr. A. A. Cole and A. G. Burrows acted as guides.

The S. Flory Mfg. Co., Bangor, whose plant was destroyed by fire July 31st, have erected temporary buildings equipped with improved high grade machinery and are ready to take care of orders as in the past.

The Roberts and Schaefer Company, Chicago, have opened a laboratory for analyzing and testing fuels.

Mr. Chas. Watson has been appointed manager of the Cobalt Townsite Mining Company, to succeed Mr. Bailey.

Mr. Stanley Graham has been appointed Professor of Mining Engineering at the Nova Scotia Technical College at Halifax.

Mr. P. A. Robbins has made an examination of the Jupiter mine for the Timmins-McMartin-Dunlap syndicate.

Norman R. Fisher, of the Timiskaming mine, Cobalt, has been appointed general manager of the Pearl Lake mines, but this position will not interfere with his duties at his Cobalt property.

Mr. Harold Roche, who has been superintendent of the North Dome mines in Porcupine for the past three months, has been placed in a similar capacity at the Pearl Lake mines, following the resignation of the general manager, Col. Stevenson.

Mr. J. B. Tyrrell will leave shortly for London, England. His address while there will be 224 Salisbury House, E.C.

Mr. J. V. Culbert is now superintendent of the Wasabika mines, West Shiningtree, Ontario.

The Canadian Allis-Chalmers Company has issued a new catalogue of mechanical power transmission machinery. It is a cloth-bound book of 300 pages and contains many useful general data as well as descriptions and price lists of the company's machinery.

The Canadian General Electric Co. has issued a bulletin on fractional horse power motors and their application.

The Canadian Collieries (Dunsmuir) have decided to install an extensive electric driven pumping plant. There will be four separate units. Two will be driven by 75 h.p. a.c. motors, and a third by a 75 d.c. motor, each unit being capable of delivering 350 gallons per minute against a head of 370 feet. The fourth unit, consisting of two pumps working in series, will deliver 350 gallons per minute, against a head of 740 feet. The pumps will be built by Canadian Allis-Chalmers, Limited, and the motors by Canadian General Electric Co., Limited.

Mr. G. F. S. Anderson, formerly of the Buffalo mine, has taken charge of the Lucky Cross gold mine at Swastika, Ont.

Mr. C. H. Hitchcock, formerly in charge of exploration at Murray mine for the Dominion Nickel Co., has been appointed geologist for the Canadian Copper Co.

Mr. F. M. Sylvester, formerly assistant manager, has been appointed general manager of the Granby, Consolidated Mining, Smelting and Power Co., to succeed Mr. J. P. Graves.

Prof. J. C. Gwillim has returned to Kingston to resume his duties at the School of Mining, after spending several months in Western Canada mining districts.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

There has been nothing unusual, other than labour troubles at some Vancouver Island coal mines, to interfere with the progress of mining in the province during the latter half of September. Weather conditions have been favourable in the metal mining districts; in the Crowsnest coal field there has been the customary occasional shortage of railway cars that is experienced every year at wheat harvest time, and the result has been that the miners have not been fully employed, losing time whenever there were not cars to take away the coal mined.

On Vancouver island there has been some advancement made toward a general resumption of operations at the mines at which a total suspension of work followed the August excesses of strikers. The Cumberland mines of the Canadian Collieries (Dunsmuir) Limited, have been worked throughout the troubled times, as is shown by their record of output of coal—47,800 tons in August, which was the month in which the rioting occurred, and approximately 52,000 tons in September. The company has resumed work at its Extension mines. At South Wellington, the Pacific Coast Coal Mines, Ltd., is working on a small scale, and expects to gradually increase its working force and its output of coal. The Western Fuel Co. has men keeping its mines in shape, as far as practicable, for a resumption of production whenever this shall be decided upon. The only company that has yet recognized the Union Mine Workers of America is the Vancouver-Nanaimo Coal Mining Co., operating the Jingle Pot mine, near Nanaimo; this company ordinarily employs fewer men and mines less coal than the others above-mentioned.

### EAST KOOTENAY.

**Windermere.**—Prospectors are again giving attention to the lower part of Findlay creek, which enters Kootenay river near the northern boundary of Fort Steele mining division. A new discovery of ore containing grey copper and galena is reported as havi[ng] been made on the south side of the creek, about six miles up from its mouth, and six mineral claims have been located there. Many years ago this creek was worked for gold by placer miners; later, in the nineties, numerous mineral locations were made on a series of quartz lodes. One of the best known of those properties was the Thunder Hill group, upon which, so i[t is] stated, $12,000 was expended, exclusive of the cost of a two-mile tramway to a mill site on Upper Columbia lake, and of a 50-ton lead concentrating mill. The latter has long been idle, the class of ore it was intended to treat not having been found in quantity. There is o[n] the creek what has been known as a copper belt, and it is to that prospectors are now going.

### SLOCAN.

**Silverton.**—The Van-Roi Mining Co.'s managers in British Columbia cabled to the company's office in London the following report for the month of August: "Estimated expenditure for August: Development, $2,550; capital expenditure, $174. Exploratory raise, main vein, level 9: Position 216 ft. west of stope 1, level 9. Height of back 80 ft. above level. Advance 50 ft., of which 36 ft. averaged 18 oz. silver, 1 per cent. lead, 13 per cent. zinc across an average width of 24 inches. Crosscut northwards, level 9—1,500 ft. west of portal: Advance 11 ft. Ore has been penetrated averaging 12 oz. silver, 11 per cent. lead, 11 per cent. zinc across an average width of 3 inches. Crosscut southwards, level 9—1,500 ft. west of portal: Advance 10 ft. Ore has been penetrated averaging 12 oz. silver, 11.5 per cent. lead, 16 per cent. zinc across an average width of 33 inches. Crosscut northwards, level 9—860 ft. west of portal: Advance 10 ft. Ore has been penetrated averaging 2 oz. 10 dwt. silver, nil lead, 16 per cent. zinc across an average width of 12 inches. Mill will be ready to start to-morrow."

### NELSON.

The resident county court judge has delivered a judgment of much interest to mining men of British Columbia. Some miners had obtained a lien under the Mechanics' Lien Act against the Kootenay Gold Mines, Ltd., operating the Granite-Poorman group of mines and a 20-stamp mill in Nelson mining division. Between \$5,000 and \$6,000 was the total of the claims against the company of 32 of its former employees. The property of the company had been mortgaged, and the mortgagees disputed the right of the employees to a prior claim on it. The judgment follows: "There is no doubt that the main object of the Mechanics' Lien Act was to give every person a lien for work and services upon or in a mine, building, etc., but where prior mortgages existed the provisions of the section dealing with mortgages are inadequate to give relief to lien-holders of the class before us, unless in the proceedings at the trial the increase in the value of the mortgaged premises can be estimated. It is not contended that the work done in this instance increased the value of the premises, and the section just referred to would have to be read out of the Act before judgment could be given as against the mortgagees' interests. A high judicial authority has decided that 'it is a serious matter to hold that where the main object of a statute is clear it shall be reduced to nullity by the draftsman's unskilfulness or ignorance of law.' I must, however, hold that insofar as work in taking out ore, unless in strictly development work, the miners and other employees at a mine cannot enforce their liens against the premises or property as against the interests of the mortgagees. I find that the lien-holders have proved their claims as appears in the evidence and direct that the same be paid by the defendant company forthwith. And in default of payment forthwith I direct that the lien-holders may proceed by sale or otherwise as may be further directed, as agreed upon by all parties interested, against the equity in the premises owned by the defendant company."

## TRAIL CREEK DIVISION.

Ore receipts at the Consolidated Mining & Smelting Co.'s works at Trail during four weeks ended Sept. 25, were as under:

| From | Tons. | Tons. |
|---|---|---|
| **East Kootenay—** | | |
| Monarch | 35 | |
| St. Eugene | 116 | |
| Sullivan | 2,628 | |
| | | 2,779 |
| **Ainsworth—** | | |
| Bluebell | 630 | |
| No. 1 | 385 | |
| Panama | 70 | |
| Retallack & Co. | 173 | |
| Silver Hoard | 235 | |
| Utica | 13 | |
| | | 1,506 |
| **Slocan—** | | |
| Eastmont | 32 | |
| Hewitt | 232 | |
| Mountain Con. | 16 | |
| Rambler-Cariboo | 300 | |
| Reco | 8 | |
| Richmond-Eureka | 116 | |
| Ruth | 39 | |
| Slocan Star | 60 | |
| Standard | 934 | |
| Surprise | 20 | |
| | | 1,757 |
| **Nelson—** | | |
| Emerald | 144 | |
| Molly Gibson | 174 | |
| Queen | 40 | |
| Silver King | 257 | |
| Yankee Girl | 326 | |
| | | 941 |
| **Rossland—** | | |
| Centre Star Group | 13,083 | |
| Le Roi | 5,499 | |
| Josie (Le Roi No. 2. Ltd.) | 1,847 | |
| | | 20,429 |
| **Lardeau—** | | |
| Ferguson | | 37 |
| **Kamloops—** | | |
| Iron Mask | | 32 |
| **State of Washington, U.S.A.—** | | |
| Ben Hur (Republic Camp) | 1,744 | |
| Bonanza | 101 | |
| United Copper | 47 | |
| | | 1,892 |
| Total | | 29,373 |

**Rossland.**—The managers of the Le Roi No. 2, Ltd., cabled from Rossland to London the following report: "Josie mine report for August: Shipped 1,620 tons of ore and 55 tons of concentrates. The receipts from smelter are \$17,303, being payment for 1,327 tons of ore shipped, and \$1,007 for 105 tons of concentrates; in all, \$18,310. Estimated costs for corresponding period: Development, \$6,000; ore production, \$12,500; milling, \$1,300. Total \$19,800. North Annie Drift, 500-ft. level: Advance, 64 ft., of which 40 ft. averaged 15 dwt. gold, 8.5 per cent copper, across an average width of 9 inches. Poorman Drift, 900-ft. level: Advance 17 ft. Also sunk 4 ft. for the purpose of connecting for ventilation. Drift 44, 900-ft. level: Advance 15 ft., of which the whole averaged 2 oz. 18 dwt. gold, 0.875 per cent. copper, across an average width of 39 inches. Raise 728, 700-ft. level: Back is 83 ft. above level. Advance 18 ft. Crosscut and drift 538, 500-ft. level: To investigate ore found in Diamond Drill hole No. 340. Advance 23 ft. crosscut and 20 ft. driven, of which 20 ft. averaged 4 dwt. gold, and 3.5 per cent. copper across 31 inches."

## VANCOUVER ISLAND.

**Victoria.**—Since Mr. Chas. H. Clapp left Vancouver Island for Arizona, in the early part of September, geological investigations have been continued in Sooke district, west of Victoria, by other members of the staff of the Geological Survey of Canada. It is understood that occurrences of copper ore in that district are regarded as of sufficient promise to warrant much development work being done to explore them.

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The Canadian Goldfields Syndicate, Ltd., has declared its dividend No. 17; amount with bonus one and one-half per cent., on the company's capital stock. This company has its head office in Montreal; its mining property is in British Columbia, but it is not now, nor has it been for a number of years, doing any mining. It derives its profits available for distribution among its shareholders from dividends it receives from the Consolidated Mining & Smelting Company of Canada, Ltd. Years ago it sold to the St. Eugene Mining Co. a group of mineral claims, now part of the St. Eugene mine group at Moyie, East Kootenay, for which it received shares in the St. Eugene Co., and, later shares in the Consolidated Co.

Shaft-House, Cobalt Townsite mine

# COBALT, GOWGANDA, AND SOUTH LORRAIN

**Cobalt Townsite—**

Following the meeting of the directors of the English syndicate which controls the Cobalt Townsite, the Casey Cobalt, the Cobalt Lake, the City of Cobalt, and the Townsite Extension, there have been several important developments. The purchase of the Northern Customs mill has been ratified and preparations are being made to rush the work necessary to connect the City of Cobalt with that plant, a long tramway being built from the shaft to the mill. To finance the purchase of the mill, or partly finance it, the capitalization of the City of Cobalt Mining Company is being raised from $1,500,000 to $2,100,000. The head office of the City of Cobalt is also being transferred from Cobalt, where it has always been, to Toronto. Another change is the placing of Mr. Chas. Watson as manager of the Cobalt Townsite. He is already in charge of the City of Cobalt for the same interests. Directly the Northern Customs mill is turned over to the English companies in November, the ore which has been piling up on the surface and also in the stopes underground will be treated as far as the capacity of the plant will allow.

The new plant of the Northern Customs concentrator is making excellent progress. All the concrete work is finished and framing has commenced. The switch into the property has been completed, and, when the machinery arrives, it can be taken in without any delay. The water will be piped from Sasaginaga Lake and will be a gravity flow.

**The Hudson Bay** output for the month of August was considerably higher than usual, this being due to the larger proportion of high grade ore in the shipments. The production for the month amounted to 73,150 ounces. The ore concentrated during the month amounted to 19.40 tons, the heads to the mill ran 21.50 ozs. to the ton. The extraction was 86.90 per cent. The stopes are being carried very wide at the Hudson Bay now.

The many friends of Mr. Stanley Graham will congratulate him on the appointment he has received as the professor of Mining Engineering at the Nova Scotia Technical College at Halifax. A graduate of Queen's, Mr. Graham had experience in Mexico before he came to Northern Ontario. His last appointment was superintendent of the Peterson Lake Mining Company.

**Kerr Lake—**

No great surprise is entertained in camp at the good showing of the Kerr Lake Mining Company in the annual report. It has been known for some time that Mr. Livermore's policy of bringing development work up to date has yielded excellent results. The report, too, was drafted before the finds were made under the drained portion of Kerr Lake.

**Cobalt Lake—**

It is stated by the management of the Cobalt Lake Mining Company that the basis of 100,000 ounces per month was maintained during September. A new development was experienced from the No. 2 crosscut when a two-inch vein carrying occasional patches of high grade ore was cut. The systematic exploration of the northern end of the lake is being proceeded with.


Northern Customs Concentrator, Cobalt

In place of Mr. Stanley Graham who has been appointed professor of Mining Engineering in the Nova Scotia Technical College, Mr. John Baker has been given the position of superintendent of the Peterson Lake Mining Company. Mr. Baker was formerly mill superintendent of the Cobalt Lake Mining Company.

**Seneca-Superior—**

While the statement that a new vein had been cut on the Seneca Superior is not true, it is accurate that the main vein has been found to carry its values 130 ft. below the 200-foot level in a winze which is now being sunk. It it still in conglomerate at that point. The contact has also been reached and some good ore has been found in the Keewatin, but no hopes are being founded on this.

**More Geologists—**

The very last party of geologists has been entertained and has gone. This small but distinguished party from the Yukon had not included Cobalt in their original itinerary, but so insistent was the demand to see Northern Ontario that about twelve of them saw the Porcupine and Cobalt camps.

**Marketing the Ore and Bullion—**

Owing to the restricted market for Cobalt ores, some difficulty is being experienced in disposing of the silver both as concentrates and crude ore. The situation has been aggravated by the determination of the two A. S. & R. smelters to refuse all ores that run higher than 7 per cent. in arsenic. As practically all high grade Cobalt ores contain considerably more arsenic than this, this virtually means the closing of the Perth Amboy and Denver smelters to the mine managers of the camp. The Coniagas smelter at Thorold can handle little more than the output of the Coniagas, and the Townshite and Deloro must give first choice to O'Brien and Miller Lake O'Brien at Gowganda. The Pennsylvania smelter at Carnegie has closed down. It is understood that the smelter at Orillia is to be rebuilt and there is a much better market for Cobalt ores abroad than formerly.

The steamship companies plying out of Canadian ports have decided to raise their rates for handling silver bullion, and it is therefore probable that the bulk of the Cobalt bullion which has been marketed in London will now go to New York. The express companies are, however, desirous of retaining the business and a way may yet be found for shipping direct to the London market.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Revival of Activity—**

There has been quite a revival of mining activity in Porcupine within the past month, not in the stock market, but in the operations in the camp. One of the most interesting developments is on the old Preston East Dome claims which reverted to its former owners. Out of an open cut on the No. 7 vein to the west of the camp buildings twenty and a half tons of gold ore were taken. The open cut was 30 feet long by 12 feet deep. The high grade streak of ore was 25 inches wide, but the open cut was two to three feet wide. Out of this approximately 24 tons of ore were taken and a total recovery of 210 ounces of gold made. A shaft is now being sunk at one end of the open cut from which another level will be developed.

**Tough-Oakes—**

It is understood that the contact between the conglomerate and the porphyry has been reached at or about the 200-foot level of the Tough-Oakes property. Remarkable high grade ore is being mined at the 100-foot level, and this is being bagged and another shipment will be sent out soon. The small mill is being kept busy, but the extraction is not much better than 50 per cent.

**Jupiter—**

Mr. P. A. Robbins, manager of the Hollinger Gold mines, has made an examination of the Jupiter gold mine for the Timmins, McMartin and Dunlap syndicate. The Jupiter mine has been closed down for some months.

**McIntyre—**

What is believed to be the extension of the Dixon system of veins has been cut in the McIntyre shaft at a depth of 390 feet. It will be drifted upon at the 400-foot level. An assay gave $12 a ton. The main shaft of the McIntyre will be continued to the 600-foot level from the 400-foot level. A lengthy crosscut will be made under Pearl Lake from No. 1 shaft to No. 5.

**Dome—**

The concrete work for the 40-stamp addition to the Dome mill will be completed in a few days when the steel work for the structure will be commenced. It is expected that the enlarged mill will be running about next March. Mr. H. C. Meek has returned from his holiday and is again in charge of operations. Mr. Ambrose Monell and other directors of the Dome will visit the plant this month.

**Three Nations—**

The Three Nations mill in Whitney township is now running. The ten-stamps have been crushing between 49 and 50 tons daily. It is possible that an additional ten stamps will be installed next spring, and a cyanide plant.

**Acme—**

Driving from the 100-foot level of the Hollinger mine, crosscuts are now being made to cut ore bodies on the Acme Gold mines, better known as the Dixon claim. The shaft is being put down from 200 to 500 feet without delay. At the No. 10 shaft, near the McIntyre line, crosscuts are now being made at 150 feet, which is equivalent to the 200-foot level of the main shaft.

**Schumacher—**

A new working shaft for the Schumacher mine will soon be available for hoisting purposes. Four hundred feet south of the old shaft a raise has been started from the 100-foot level to the surface. The new shaft will be one of three compartments. The enlarged plant will be in good working order before the snow flies.

Mr. Edward Yorke, formerly manager of the Hughes Porcupine, is now in charge of the mine d'Or Huronia, in Gauthier township, in the Larder Lake district. Mr. Porteous, formerly mill superintendent of the Vipond, has taken his place.

**Miracle—**

A compressor plant for the Miracle mines is soon expected to arrive. It will be taken in from Connaught station, the claims being situated in Langmuir township. So far only test pits have been put down, but this winter a main working shaft will be started.

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It is stated that a mine-rescue apparatus, made in England, which does away with the use of the helmet, weighs only 28 lbs., and it is claimed that a man using it can work in deadly gases more than five hours.

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A report from Vancouver, B.C., is to the effect that the company operating the White Pass and Yukon route to Dawson intends to extend its line toward the Chisana or Shushanna gold field, in western Alaska, this extension to be in Canadian territory.

# STATISTICS AND RETURNS

### COBALT ORE SHIPMENTS.

Shipments from the Cobalt camp were exceptionally low during the week ending Oct. 11, both from a standpoint of tonnage and value. Of the seven cars of ore which left the camp, four were of low grade values. In addition to the ore shipments being below the average, the bullion shipments, while fairly high in figures, included but one shipment, that from the Nipissing mine.

The LaRose sent out four cars of low grade during the week, the heaviest low grade shipment in a week from the property since the contract with a local customs concentrator was signed several years ago. One hundred and seventy-five tons were despatched by the LaRose during the week, going to Newark, N.J.

The high grade shippers during the week were the Trethewey, McKinley-Darragh and O'Brien mines, the first named sending to Denver. Last week a shipment from the Cobalt Aladdin company, the new English concern, now working the Silver Queen, was omitted from the list. This car was of high grade ore and the first sent from the Silver Queen property since the balmy days of that company.

The bullion shipment of the week was from the Nipissing mines. The total value was nearly $75,000.

The ore shipments tabulated as to high and low grade were as follows:

| | High | Low | Totals |
|---|---|---|---|
| LaRose | 0 | 4 | 348,600 |
| O'Brien | 1 | 0 | 87,400 |
| McKinley-Darragh | 1 | 0 | 71,665 |
| Trethewey | 1 | 0 | 40,000 |
| | 3 | 4 | 547,665 |

The bullion shipments for the week ending Oct. 11, were:

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 100 | 118,924.91 | $73,138.82 |

The shipments for the year to date are:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 4,749,936.33 | $2,719,879.45 |
| Penn-Can | 14,141.60 | 8,456.90 |
| Buffalo | 1,240,607.90 | 772,301.57 |
| Crown Reserve | 364,056.00 | 222,877.25 |
| Dom. Red | 352,183.40 | 203,277.15 |
| Townsite | 36,818.40 | 30,364.04 |
| Miscellaneous | 3,920.00 | 1,623.00 |
| Timiskaming | 25,561.70 | 14,948.04 |
| O'Brien | 146,542.77 | 78,423.66 |
| Wettlaufer | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 13,529.83 | 8,282.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 67,817.79 | 40,873.48 |
| Bailey | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Wettlaufer | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| Lumsden | 1,814.40 | 1,079.00 |
| Beaver | 1,837.00 | 1,138.94 |
| | 7,046,599.83 | $4,168,799.62 |

### GOLD PRODUCTION OF CANADA.

"United Empire," the journal of the Royal Colonial Institute published in England, included the following paragraph, under the subhead "Canada," in its "Round the Empire: Monthly Notes," in September number:

"Geological Congress—The twelfth International Congress is to be held this year in Canada, and special care is being taken to ensure that all branches of mining shall be represented. The advance in the value of industrial metals is remarkable. The gold output, which until recently overshadowed other forms of mining, is steadily declining. On the other hand, the value of copper, tin and wolfram has become notably high, while the rarer minerals are also coming to the front, so that the prospector of to-day has new possibilities to take into account."

It may be that the foregoing comments on industrial metals were intended to be general, but if they are supposed to be applicable to Canada only, then the writer is astray in some of his alleged facts. Tin and wolfram have no place in recently published Dominion mineral production tables. The value of the 1912 production of copper was certainly high—the highest yearly total on record. The statement as to gold is not correct as regards Canada's production of that metal during seven years, 1906-1912, as will be seen by examination of the following comparative table, compiled from statistics published by the Mines Branch of the Canada Department of Mines, although it is admitted that for the previous seven-year period, 1899-1905, the total was much larger. In order to show the chief sources of the gold production of Canada, that of Yukon and British Columbia appears separately:

| Year. | From Yukon. | From Brit. Columbia | From all other parts of Dominion. | Total. |
|---|---|---|---|---|
| 1906.. | $5,600,000 | $5,579,039 | $ 323,081 | $11,502,120 |
| 1907.. | 3,150,000 | 4,883,020 | 349,760 | 8,382,780 |
| 1908.. | 3,600,000 | 5,929,880 | 312,225 | 9,842,105 |
| 1909.. | 3,960,000 | 5,174,579 | 247,651 | 9,382,230 |
| 1910.. | 4,570,362 | 5,403,318 | 232,155 | 10,205,835 |
| 1911.. | 4,634,574 | 4,930,145 | 216,358 | 9,781,077 |
| 1912.. | 5,540,000 | 5,167,390 | 1,852,053 | 12,559,443 |

It is true there was a steady decrease in total value of the gold production of the Dominion as a whole from its maximum yearly output of $27,908,153 in 1900 to $8,382,780 in 1907, but far from the production, since the latter year, having "steadily declined," it will be seen that as compared with 1907 the estimated production of 1912 shows an increase of approximately 50 per cent., while there is good reason to expect that the revised figures for the latter year, when they shall be available, will make an even somewhat better showing. Further, having in mind that Yukon, British Columbia and Ontario have each produced more gold during the expired portion of 1913 than for the corresponding portion of 1912, there is ample warrant for expecting an appreciably large increase in 1913 over 1912 and, of course, a higher percentage of increase over 1907.

Should it be contended that "United Empire" referred to production of a larger field than Canada, the figures above quoted may not be used as evidence that that publication is in error. However, this good purpose will be served—they will show that Canada's production of gold was larger in 1912 than in any other year since 1905. It may be added that the great decrease from the maximum above shown was chiefly in the production of Yukon Territory—from its maximum of $22,275,000 in 1900 to $3,150,000 in 1907.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.) Oct. 14, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 4.75 | 5.00 |
| Alaska Gold | 21.50 | 21.62½ |
| British Copper | 2.50 | 2.62½ |
| Braden Copper | 7.00 | 7.12½ |
| California Oil | .... | .... |
| Chino Copper | 38.75 | 38.87½ |
| Giroux Copper | 1.12½ | 1.50 |
| Green Can. | 30.00 | 34.00 |
| Granby. | 70.00 | 70.50 |
| Miami Copper | 22.00 | 22.12½ |
| Nevada Copper | 14.87½ | 15.00 |
| Ohio Oil | 130.00 | 132.00 |
| Ray Cons. Copper | 18.75 | 18.87½ |
| Standard Oil of N. Y. | 149.00 | 151.00 |
| Standard Oil of N. J. | 375.00 | 377.00 |
| Standard Oil (old) | 1145.00 | .... |
| Standard Oil (subs.) | .... | .... |
| Tonopah Mining | 4.62½ | 4.75 |
| Tonopah Belmont | 7.00 | 7.25 |
| Tonopah Merger | .59 | .60 |
| Inspiration Copper | 15.00 | 15.50 |
| Goldfield Cons. | 1.37½ | 1.43 |
| Yukon Gold | 2.00 | 2.25 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex. | .00½ | .01 |
| Dome Extension | .06½ | .07½ |
| Dome Lake | .15 | .16 |
| Dome Mines | 10.00 | 10.25 |
| Eldorado. | .... | .01 |
| Foley O'Brien | .19 | .22 |
| Hollinger. | 17.10 | 17.20 |
| Jupiter. | .08 | .09 |
| McIntyre. | 2.00 | 2.10 |
| Moneta. | .02 | .04 |
| North Dome | .... | .25 |
| Northern Exploration | .50 | 1.00 |
| Pearl Lake | .12½ | .13 |
| Plenaurum | .... | .75 |
| Porcupine Gold | .07 | .08 |
| Imperial. | .01½ | .02 |
| Porcupine Reserve | .... | .06 |
| Preston East Dome | .01½ | .02 |
| Rea. | .10 | .20 |
| Standard. | .... | .01 |
| Swastika. | .02 | .03 |
| United | .... | .01 |
| West Dome | .08 | .10 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey. | .07 | .07¼ |
| Beaver. | .27½ | .28½ |
| Buffalo. | 2.00 | 2.20 |
| Canadian. | .... | .22 |
| Chambers Ferland | .13 | .14 |
| City of Cobalt | .25 | .35 |
| Cobalt Lake | .45 | .50 |
| Coniagas. | 7.50 | 7.75 |
| Crown Reserve | 1.57 | 1.60 |
| Foster. | .04 | .05 |
| Gifford. | .01½ | .02 |
| Gould. | .02 | .03 |
| Great Northern | .12 | .12¼ |
| Hargraves. | .02 | .02⅛ |
| Hudson Bay | 70.00 | 72.00 |
| Kerr Lake | 3.90 | 3.95 |
| La Rose | 1.94 | 1.97 |
| McKinley. | 1.42 | 1.45 |
| Nipissing | 8.30 | 8.50 |
| Peterson Lake | .26½ | .27 |
| Right of Way | .04 | .05 |
| Rochester. | .02½ | .03 |
| Leaf. | .02 | .02½ |
| Cochrane. | .30 | .50 |
| Silver Queen | .03 | .05 |
| Timiskaming. | .17 | .18 |
| Trethewey. | .27 | .30 |
| Wettlaufer. | .06 | .09 |
| Seneca Superior | 2.50 | 3.00 |
| Porcupine Crown | 1.30 | 1.34 |
| Teck Hughes | .29 | .30 |

## TORONTO MARKETS.

Oct. 13.—(Quotations from Canada Metal Co., Toronto).
- Spelter, 5 cents per pound.
- Lead, 5.75 cents per pound.
- Tin, 43 cents per pound.
- Antimony, 9 cents per pound.
- Copper, casting, 17½ cents per pound.
- Electrolytic, 17½ cents per pound.
- Ingot brass, 11 to 15 cents per pound.

Oct. 13.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).
- Summerlee No. 1, $26.00 (f.o.b. Toronto).
- Summerlee No. 2, $25.00 (f.o.b. Toronto)

Oct. 13.—(Quotations from Elias Rogers Co., Ltd., Toronto).
- Coal, anthracite, $8.00 per ton.
- Coal, bituminous, lump, $5.25 per ton.

## GENERAL MARKETS.

Oct. 10.—Connellsville Coke (f.o.b. ovens).
- Furnace coke, prompt, $2.15 to $2.25 per ton.
- Foundry coke, prompt, $2.75 to $3.00 per ton.

Oct. 10.—Tin, straits, 40.30 cents.
- Copper, Prime Lake, 16.50 to 16.75 cents.
- Electrolytic Copper, 16.25 to 16.37½ cents.
- Copper wire, 17.25 to 17.50 cents.
- Lead, 4.50 cents.
- Spelter, 5.40 to 5.50 cents.
- Sheet zinc, (f.o.b. smelter) 7.75 cents.
- Antimony, Cookson's, 7.50 to 7.60 cents.
- Aluminum, 20.00 to 21.00 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, ordinary, $44.50 to $45.00 per ounce.
- Platinum, hard, $50.00 to $51.00 per ounce.
- Bismuth, $1.95 to $2.15 per pound.
- Quicksilver, $39.00 per 75-lb. flask.

## SILVER PRICES.

| | New York. cents. | London. pence. |
|---|---|---|
| Sept. 25. | 61⅝ | 28 7/16 |
| " 26. | 61⅞ | 28 9/16 |
| " 27. | 61⅞ | 28 9/16 |
| " 29. | 61¾ | 28½ |
| " 30. | 61¼ | 28 5/16 |
| Oct. 1. | 61⅜ | 28 5/16 |
| " 2. | 61½ | 28⅜ |
| " 3. | 61⅝ | 28 7/16 |
| " 4. | 61⅜ | 28 5/16 |
| " 6. | 61 | 28⅛ |
| " 7. | 61¼ | 28¼ |
| " 8. | 60⅞ | 28⅛ |
| " 9. | 60⅞ | 28⅛ |
| " 10. | 60⅞ | 28⅛ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.



## ASSAYERS, CHEMISTS AND ORE TESTERS.



## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

# BUYERS AND SELLERS OF METALS

# PROVINCE OF QUEBEC

## Department of Colonization, Mines, and Fisheries

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,**
**Commissioner of Public Works and Mines,**
**HALIFAX, N. S.**

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Northern Canada Supply Co.

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**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co. Ltd
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty & Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
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Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
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Canadian Westinghouse.

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Geo. G. Blackwell Sons & Co.
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Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

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Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

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Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
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Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
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Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
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Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
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Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

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Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
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Smart-Turner Machine Co.

**Quarrying Machinery—**
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Krupp, Fried. A.G., Germany.
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Northern Canada Supply Co.
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Krupp, Fried. A. G., Germany.

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Krupp, Fried. A. G., Germany.
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Jenckes Machine Co.
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Can. Ingersoll-Rand Co., Ltd.
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E. Leonard & Sons.
Siemens Co. of Can., Ltd.

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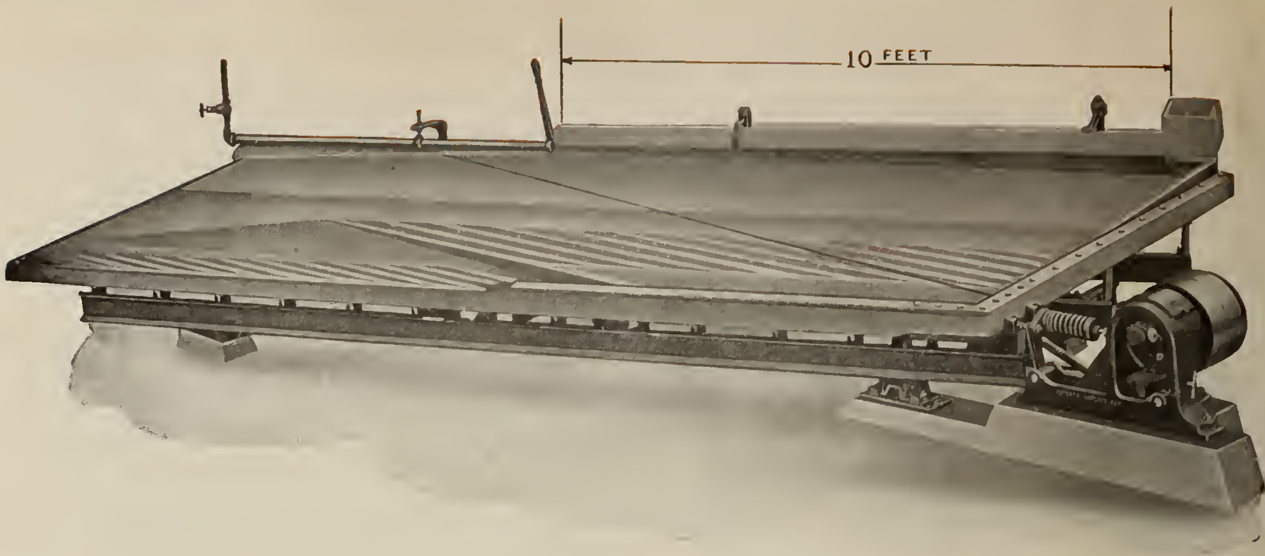


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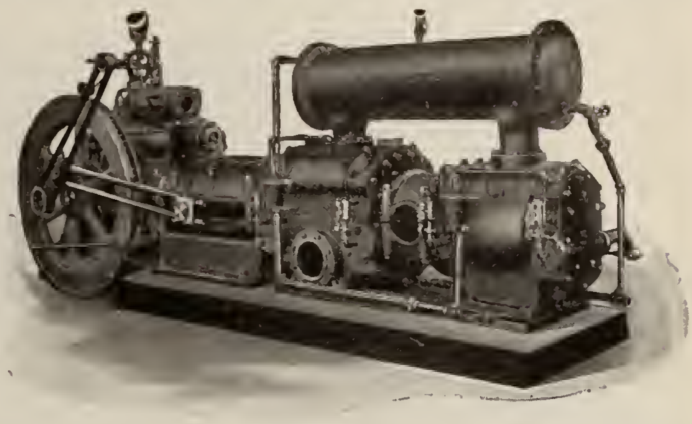

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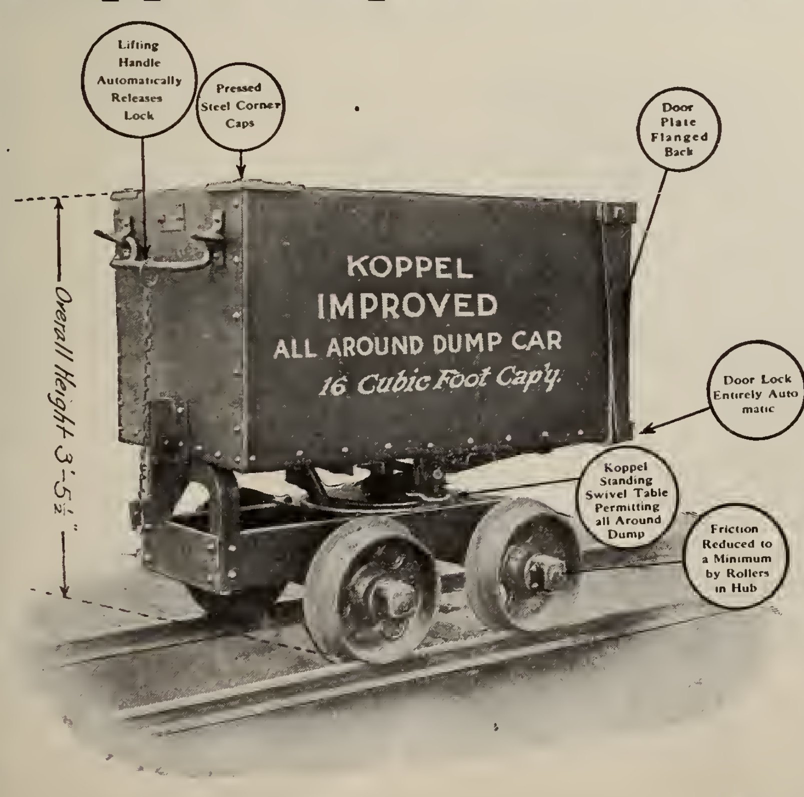


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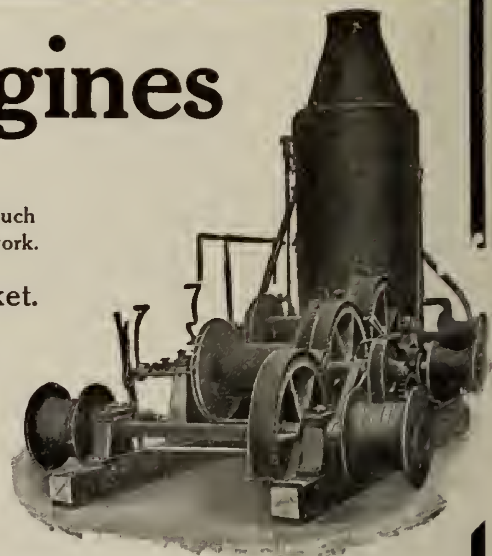

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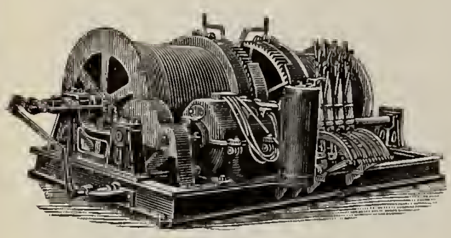

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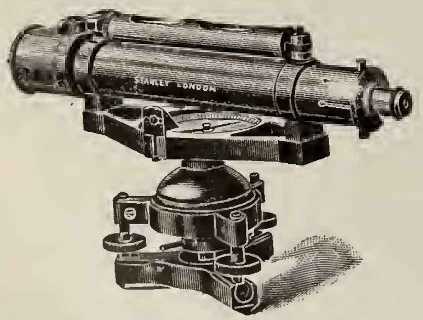

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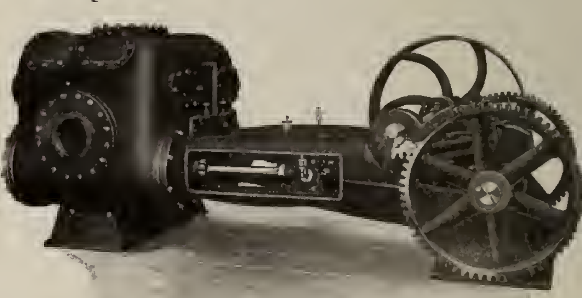

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# THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, November 1, 1913. No. 21

## The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

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*Editor*

REGINALD E. HORE

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CONTENTS.



## MINERAL PRODUCTION OF CANADA--1912

The annual report of Mr. John McLeish, Chief of the Division of Mineral Resources and Statistics, containing revised figures for the year 1912, has been published by the Mines Branch, Ottawa.

Mr. McLeish's report shows that the output has increased greatly over that of previous years. For 1912 the total value was $31,827,302, or 30.8 per cent. greater than that of 1911, amounting to $135,048,296. The value per capita has increased from $2.23 in 1886 to $18.27 in 1912.

Noteworthy features of the year, which was by far the most successful year in the history of the mineral industry in Canada, were the extensive development of ore reserves, particularly Sudbury nickel copper ores, Porcupine gold ores, and British Columbia copper and lead ores, extension of ore smelting and refining facilities, improvements in methods of treatment of the ores and good prices received for the metals.

The production of metalliferous products in 1912 was valued at $61,172,753, being 45.3 per cent. of the total mineral output. The value of non-metalliferous products was $45,080,674.

The Mines Branch has endeavoured to obtain from every mine operator in Canada an annual report with respect to the number of men employed and wages paid, the total tonnage of ores mined, the tonnage concentrated and the quantities of concentrates produced, the tonnage of ore or concentrates shipped, and the net value thereof, the quantities of metals as determined by settlement assays contained in the ores shipped, and the quantities of metals for which payment was made by the purchaser's smelter or recovered by the operator's smelter. This has been successfully done, and with the exception of two products, placer gold and petroleum, Mr. McLeish's report contains this very interesting information with respect to each of the products.

The total number of men employed in 1912 in metalliferous mines was 10,612. Wages paid amounted to $10,113,578. There was mined 4,194,517 tons of ore. Total net value of shipments from metalliferous mines was $46,018,233; in non-metalliferous mines, exclusive of stone quarries and clay pits, there were employed in 1912 an average of 33,954 men, earning in wages $23,-877,781. The tonnage mined, chiefly coal, was 17,165,-628, having a net value of $45,080,674.

The report contains also a statement of the production of the several smelting and refining companies operating in Canada, and is an admirable summary of the progress of the mineral industry for the year 1912.

## GOWGANDA

Gowganda progresses in spite of many difficulties. In our special correspondence this week will be found several items of interest concerning this silver district. For numerous reasons Gowganda has not had a fair chance to make good. Chief among these is lack of transportation facilities, and it is unfortunate that the Gowganda road is still in such bad condition in spite of the urgent necessity of improvement.

## LABOUR ORGANIZATION IN CANADA

Membership in the labour unions is growing. The annual report of the Department of Labour, recently issued, shows that there was an increase last year from 133,132 to 160,120. This is equivalent to about two per cent. of the population.

The Department estimates the number of wage-earners in Canada at 1,300,000. About one-eighth are members of unions.

Nearly the whole membership is in organizations, which have their headquarters in the United States, and most of which are in affiliation with the American Federation of Labour. The latter organization is the most important of its character in North America, and has a membership of about 2,000,000.

Organization has proven a great boon to wage-earners in Canada. At the annual Trades Congresses vital subjects are discussed. Deputations place the resolutions before the Dominion and Provincial Governments and urge action. The serious deliberations of the Trades Congresses command attention and respect and organized labour gains influence thereby.

The two miners' unions which are affiliated with the American Federation of Labour are the United Mine Workers of America, and the Western Federation of Miners. Both these organizations are now conducting strikes characterized by lawlessness, by violence and intimidation. The miners would do well to use other means to gain their ends. They could take a lesson from the workers in some of the other industries.

At the beginning of the year the United Mine Workers had a membership of 5,631 in Canada, and 381,334 elsewhere, and the Western Federation had a membership of 5,947 in Canada, and 55,000 elsewhere.

## THE GRIEVANCE PROBLEM

It is often contended by miners, as by those engaged in other industries, that adequate provision is seldom made for the airing of grievances. The complaint is made that an employee who goes to the manager to register a complaint, thereby incurs the ill-will of his employers and makes his position worse instead of better. Some employees state that as a result of going to the manager they become immediately subject to the displeasure of the under bosses and suffer accordingly.

There can be little doubt that an opportunity for easy access to those in authority would establish better relations. Grievances aired become less intolerable. Many are imaginary, being based upon incomplete knowledge of the facts and unfair comparisons. Some are real and can be removed only when fully understood by both parties.

In the recent investigation of the strike of miners in the Michigan copper district, the Copper Country Commercial Club found that most of the contentions of the strikers were ill-advised. The officers of the Western Federation showed much anxiety over recognition of themselves as representatives of the miners; but failed to present the investigating committee with any statement of the grievances of the copper miners. The committee, after investigation, however, came to the conclusion that the miners have no suitable means of lodging complaints, and they have recommended that each manager set aside a day or half-day of each week for the express purpose of hearing grievances of employees, that he investigate every complaint, and adjust every legitimate grievance with all possible speed, and see that no man is discriminated against because of presenting complaints.

It seems necessary to reassure the employees that they will be given a proper hearing and that everything reasonable will be done to adjust real or dispel imaginary grievances.

The companies will do well to consider the recommendations favourably.

## WESTERN FEDERATION METHODS

In an attempt to settle the strike of Michigan copper miners, the Copper Country Commercial Club appointed a committee to investigate the subject from all sides and make a report to Governor W. N. Ferris. The mining companies assisted this committee in every possible way and allowed free access to all the data bearing on the subject. From the investigation a voluminous report has been made.

The officers of the Western Federation were asked to present to the committee their side of the case. The vice-president of the Federation, who has been in Calumet in charge of the strike since its inception, was asked to present all the facts and grievances and demands upon which were based the calling of the strike. Later a second invitation was personally extended to Mr. Mahoney to furnish to the committee the above data and a statement of conditions in the copper country which the Western Federation of Miners was seeking to better. The committee reports that this information has not been furnished.

As the strikers have been now out of work for three months it is evident that they must soon find employment. The avowed purpose of the committee was to locate the trouble and endeavour to remove it. The action of the union officers has made this difficult. It has, however, made more clear the impression that the strike was not called so much for the benefit of copper country miners as for the organization which a number of them have been induced to join.

## THE NANAIMO STRIKE

Published accounts of the report of Mr. Samuel Price, K.C., on the U. M. W. A. coal miners' strike on Vancouver Island indicate that the trouble there is in some respects similar to that in the copper mines of Michigan.

The report points out that the real object of the strikers is to establish a branch of the U. M. W. A. and to compel recognition of it by the employers.

To obtain their end, the members of the U. M. W. A. have used the same violent methods as have the members of the Western Federation.

It seems little more than folly to expect desired results when such methods are used. To destroy property, libel the managers, and assault employees who wish to work, and then expect to be rewarded by concessions is ridiculous. The right of men to organize to improve conditions is well recognized; but the members of unions would do well to endeavour to gain their ends by lawful means.

## NANAIMO RIOTERS PUNISHED

Press despatches state that forty men have been found guilty of rioting in connection with the strike of coal miners at Nanaimo and sentenced. Three men and two boys will serve two years in the penitentiary, twenty-three will be imprisoned for one year and are subject also to a fine of $100 each. Eleven were sent to jail for three months and fined $50 each. Several union officers were sentenced. It is reported that the United Mine Workers are now ready to call the strike off.

The authorities are to be commended for making it clear that, no matter what dispute there may be between labourer and employer, violence will not be tolerated.

## OIL IN ALBERTA

Numerous reports are current concerning discoveries of oil near Calgary. Gas has been found in large quantity in Alberta; but there are as yet no producing oil wells. It is quite probable that oil exists, and it may be that really important discoveries have been made.

As yet, however, no large quantity of oil has been found and investors will do well to be wary.

At a recent meeting of the Calgary city officials and Board of Trade a warning was issued urging the public to exercise care in investments in oil leases or in the stocks of companies which have been or may be formed for oil exploitations.

This prompt action, taken to protect the public, will be much appreciated.

An Ottawa despatch states that Mr. D. B. Dowling has been sent by the Department of Mines to investigate the discoveries. Mr. Dowling is a mining geologist who is very familiar with the coal and gas fields and his report will be of much interest.

## BRITANNIA MINES

As Mr. Wm. Fleet Robertson has pointed out in his annual report for 1912, comparatively little is heard of the operations of the Britannia mines at Howe Sound, B.C. The owners have established an elaborate plant and are producing a large tonnage of ore. According to the report of Mr. Robertson the production in 1912 was between 14,000,000 and 15,000,000 pounds of copper and between 70,000 and 80,000 ounces of silver. A flotation process is used in concentrating the ore, and it is said to be proving very successful.

## COAL PRODUCTION ON VANCOUVER ISLAND, B. C.

The statement has been made repeatedly by leaders of the striking coal miners on Vancouver Island, British Columbia, that but little coal has been produced at the mines of the Canadian Collieries (Dunsmuir), Limited, since the union miners went on strike in September, 1912. The following figures show the production at that company's Cumberland and Extension mines, respectively, during eight months of the current year to September 1:

| 1913. Month. | Cumberland. Long Tons. | Extension. Long Tons. |
|---|---|---|
| January | 27,429 | 1,022 |
| February | 29,516 | 2,471 |
| March | 36,313 | 3,862 |
| April | 38,225 | 4,433 |
| May | 40,087 | 5,012 |
| June | 42,661 | 6,020 |
| July | 48,407 | 7,337 |
| August | 47,815 | 3,254 |
| Totals | 310,453 | 33,411 |

In the corresponding period of 1912 the output was 397,312; for 1911 it was 353,665. The output at Cumberland mines for last month (September) was 52,187 tons; for the last day of that month is was 2,337 tons. The average per day for 26 working days was 2,007 tons. Work was suspended at Extension during the first half of August, but it was resumed recently and coal is now being mined there.

## U. S. COAL PRODUCTION IN 1912.

The total production of coal in the United States in 1912 was 534,466,580 short tons; spot value, $695,606,071.

The total production of Pennsylvania anthracite in 1912 was 75,322,855 long tons (equivalent to 84,361,598 short tons); spot value, $177,622,626.

The total production of bituminous coal and lignite in 1912 was 450,104,982 short tons; spot value, $517,983,445.

In 1912 the production of coal in the United States not only surpassed all previous tonnage records, but the average value per ton exceeded that of any normal year in the 33 years for which statistics are available. In fact, with respect to the latter, there has been only one year in which coal prices generally were higher than in 1912. This was in 1903 when, because of the fuel famine produced by labour troubles in the anthracite region of Pennsylvania and in the organized bituminous States, prices were advanced above and figures reached in recent history. The higher values in 1903 were notably exhibited in the bituminous regions, anthracite companies as a rule holding to the circulars, which maintained the prices of the previous year plus the increased cost due to the advance in wages and the reduced working time granted in the strike settlement. The average value per ton for anthracite in 1912 was higher than in 1903, and was again due to further advances in wages.

# CORRESPONDENCE

## A FEDERAL MINING LAW.

Editor Canadian Mining Journal:

Sir,—A press despatch sent out from Ottawa in September included the following: "New mining regulations are provided in a bill to be introduced at the next session of Parliament by Hon. Louis Coderre, Secretary of State and Minister of Mines. It is expected that an entire new mining law will be placed on the statute book and that the system of mining regulations now governing the administration of mines will be abolished. . . . The difficulty encountered in framing a Dominion mining law is found in provincial rights. The mining laws at present in force in Nova Scotia, New Brunswick, Ontario, and British Columbia, were passed before Confederation, while Alberta only last year passed a new provincial mining law."

Passing over the misstatement that British Columbia's mining laws were passed before Confederation, I desire to remind those interested in the subject that much progress toward the enactment of a Federal mining law was made about three years ago, before the present Federal government displaced the Laurier administration, and that Hon. Wm. Templeman, then Dominion Minister of Mines, heartily co-operated with those who did the work relative to which some information is here given.

In passing, I will state that I have been prompted to write on this subject by what is, in my opinion, unjust and uncalled for editorial comment, made in a provincial newspaper, as follows: "A new mining law is to be enacted to afford better protection to the miner and the prospector. The late government was too busy caring for the big fellow, the man with the roll, to bother about the interests of the miner and the prospector."

The excerpts that follow have been made from the Journal of the Canadian Mining Institute for 1911 and 1912, respectively. They will serve to indicate what progress was made during the last years of office of the Laurier administration, and by whom. The only comment I have to make at this time is that I deprecate the making of statements that deny common justice to either political opponents or friends. While the present administration has my support, I do not hesitate to give credit to the Canada Department of Mines under the Laurier government for much useful work, and especially for much that resulted in very material benefit to mining in British Columbia, though, of course, we have to thank only our Provincial Legislature for the excellent mining laws of this province.

From the annual address of the President of the Canadian Mining Institute, at Quebec, March 1, 1911:

"Possibly in no direction have the activities of the Institute been engaged to better purpose than in publicly voicing the opinions of the mining communities with a view to influencing legislation. Thus in recent years representations have been repeatedly and successfully made to both the Federal and Provincial governments on questions affecting or likely to affect the industry; and special reference may be here appropriately made to a very important work of this nature undertaken during the past year by the Legislative Committee of the Institute. It has long been a matter of just complaint that the conditions in respect of the granting of title to mining lands subject to Federal control were aggravating and unsatisfactory, since they were fixed not by Statute, but by Order in Council, and, consequently, unstable and uncertain. Acting, then, under the direction of the Council, the Legislative Committee interviewed the Prime Minister and the Minister of Mines in April, 1910, and represented to those gentlemen the importance of placing a mining law on the statutes of the Dominion regulating the issue of title to mineral lands. The question was also debated by the committee before the Select Committee on Mines and Minerals of the House of Commons, and the government, having consented to introduce a bill, invited the Institute to suggest the principles on which it should be formulated. Certain recommendations were in consequence made by the Institute's committee and having been approved by the Council were duly submitted to the authorities; whereupon the Minister of Mines appointed Mr. J. M. Clark, K.C., of Toronto, to draft a bill on the lines suggested for early submission to parliament."

From the report of the Council for year 1910-1911:

"The most important work undertaken by the Institute during the year has been the endeavour to induce the Dominion government to act on the recommendations of the Select Standing Committee of the House of Commons on Mines and Mining. These recommendations were (1) that there be assigned to the Mines Department the administration of mines, including the issue of title thereto, and of all mining laws; and (2) that an act be passed consolidating all the laws relating to mines under Federal control. . . . " (Here follows a statement of the actions of the Institute Committee and of its recommendations after these had been endorsed by the Council of the Institute.)

From the President's address, Toronto, March 6, 1912:

"Among the more important undertakings in which the Institute has been engaged during the past year was drafting, at the request of the Federal government, of a code of mining laws for that portion of Canada in which the minerals are still under Federal control. A bill, embodying this code and based on the principles advocated by the Institute, is now ready for submission to parliament."

From the report of the Council for year 1911-12:

"Federal Mines Act.—As reported last year, the Institute was successful in inducing the late government to take preliminary action towards the adoption of a mining law for the Dominion, and in this regard the Council desires to place on record its appreciation of the services rendered by Mr. G. G. S. Lindsey, chairman of the committee, who presented the case to the Prime Minister on behalf of the Institute, and, in general, is responsible for advancing the business to its present stage. A draft of a bill, based on principles advocated by the Institute, was duly prepared. This draft was carefully revised by Mr. F. T. Congdon, M.P., and Mr. R. W. Brock, Director of the Geological Survey, and resubmitted to the Institute's committee for final approval. It was designed that the bill should be presented to parliament at last summer's session; but unfortunately other business deemed to be more pressing was given precedence. Meanwhile the attention of the present administration has been called to the requirements in this direction, and it is hoped that the bill will be made law during the present session of parliament."

It would seem that, two years having elapsed since the present government took office, much longer delay in this matter, which is of particular importance to those interested in mining lands under Federal control, will not be reasonable.

E. JACOBS.

Victoria, B.C., October 13, 1913.

# A VISIT TO MINES OF ALBERTA AND BRITISH COLUMBIA

By Reginald E. Hore.

(Continued from October 1st issue.)

From Fernie the party travelled down the Elk river valley, passing through a district which contains many coal seams. At Morrissey creek nine seams have been worked at the Carbonado mines of the Crowsnest Pass Coal Company; but owing to the great quantity of gas encountered no mining is being done here at present. South of Morrissey creek there is a block of 45,000 acres of coal land held in reserve by the Dominion Government.

South of Morrissey the valley of the Elk river becomes narrower and at Elko the stream enters a narrow canyon carved into the flat-lying Cambrian rocks. The party left the train here and walked to the canyon where Mr. Schofield described the geological features of the district.

"**The Rocky Mountain geosyncline,** which includes the greater part of the Selkirk, Purcell, and Rocky Mountain ranges, consists of pre-Cambrian, Paleozoic, and Mesozoic sediments. Their western border passes through Coeur d'Alene, Kootenay, and Shuswap lakes, along whose shores is exposed the old crystalline complex, from which part of the above sediments was derived.

"The Rocky mountains on the east are separated from the Purcell range on the west by the wide Kootenay-Columbia valley. This topographic feature, which is of first importance in the structure of the region, is called the Rocky Mountain trench. The rocks which form the greater part of the Purcell range are probably pre-Cambrian in age, and their structure is of an entirely different character to that of the Rockies. The Purcell sediments were first folded into a series of northerly plunging anticlines and synclines. Later these folds were truncated by normal faults which strike in a N.E.-S.W. direction and hence trend in a direction at right angles to those of the Rocky mountains. It is probable also that the fault system of the Rockies truncates that of the Purcells, for, in the Rocky Mountain trench, a block of Mississippian limestone is down-faulted in contact with the pre-Cambrian quartzites, and this block trends in a N.W.-S.E. direction. From the above facts it is probable that the Purcell range was built prior to the Rockies, and that the two ranges are structurally separated by the Rocky Mountain trench.

"On the hill to the north of Elko is exposed a section showing the transition from the Cambrian (?) quartzites at the base of the hill to the lower Paleozoic limestones at the summit. Elk river, which above this point had been flowing in a hanging valley, now swings to the southwest, and enters a narrow canyon carved into the flat-lying Cambrian, argillaceous quartzites, and joins Kootenay river at grade about 15 miles southwest of Elko."

**B party, Excursion C 2. International Geological Congress**
**At International Coal mine, Coleman, Alberta**

The accompanying photograph shows a view up the stream from the point visited.

The canyon is a truly beautiful one, and there was some difficulty in getting the passengers back to the train. This was possibly because of the fact that after having done so much walking before breakfast many had little desire to do any more. The activity of the guides, however, made it almost impossible for anyone to loiter, and the train pulled out, on time as usual, with all hands on board.

For some distance southwards down the valley of the Elk river the Canadian Pacific and Great Northern railroads run close together. At Elko the C. P. R. leaves the Elk, however, and runs north-westerly across the valley of Kootenay river, then southwards to Moyie Lakes and down the valley of the Moyie river. At Moyie is the St. Eugene silver-lead mine.

**St. Eugene Mine.**—The St. Eugene until recently has been a very large producer of silver-lead ore. On June 30, 1912, the date of the last annual report, it had produced 1,015,280 tons of ore and 190,121 tons of concentrates from which was recovered 5,319,150 ounces of

Elk River at Elko, B.C.

silver and 227,614,836 pounds of lead. The gross value of the production was $10,527,985. During the past two years the mine has been only a small producer. The Consolidated Mining and Smelting Company, of Canada, owns the property.

**Kootenay Lake.**—The C. P. R., or rather one branch, leaves the Moyie river at Curzon and crosses westward down Goat river to the Kootenay river and Kootenay Landing. Here the party left the train, which was taken by ferry up to Proctor, and boarded a steamer for the trip up the lake to Nelson.

This proved very delightful and a welcome change after several days' confinement in the sleepers.

Kootenay lake is a long narrow sheet of water hemmed in by mountain ranges. Here and there along the shore there are low places, gravel beaches at the mouths of entering streams; but almost continuously the shores rise steeply to lofty hills. To the west is a range of very rugged mountains. The snow-capped peaks backed by heavy clouds presented view after view which won the admiration of the party as the steamer carried us along on the quiet waters of the lake.

On the more gentle slopes which occur in places along the east shore there are a number of small clearings, fruit ranches, which in comparison with the great stretches of unbroken forest look wonderfully small from the middle of the lake.

Half way up the lake a stop was made to visit the Halcyon Springs Hotel and the hot springs which attract its guests.

From the hotel there is a splendid view of the snow-capped mountain peaks to the west. In fact the view was so pleasing that many of the party felt quite content to stay and look, while the others made the hot climb up to the springs. And then also there was a tame bear whose antics caused many distinguished scientists to forget their original object in climbing the hill.

**West Arm.**—The route continues north for some miles further and then at Proctor turns sharply to the west along a narrow arm of the lake to Nelson. This part of the trip was made in the early evening. The approach to the mining town is up a very narrow sheet of water enclosed by high hills. Along the south shore the C. P. railway has been built almost at the water's edge and some of the difficulties of construction that have been overcome in the mountains are here to be appreciated. Later on the trips to Rossland and Grand Forks it became more and more clear that the railway has been constructed and is operated under conditions which would have frightened many companies.

**Nelson.**—After a trip up the beautiful lake, walled in by mountains and presenting the appearance of a great river, the steamer reached Nelson early in the evening. A splendid reception was met with here. The Board of Trade and the mining men of the district did their utmost to entertain the visitors. A pleasant evening and much of the night was spent as the guests of the citizens. Mr. Coderre was prevailed upon to stay over the following day to talk with some of the men interested in the zinc problem. An account of this meeting has been already published in the Journal.

Of Nelson and vicinity, Mr. O. E. Leroy says: "The City of Nelson is situated on the delta of Cottonwood creek which flows into the west arm about 22 miles west of the main body of Kootenay lake. The city owes its existence primarily to the mining activity in the later 80's and for some years its growth depended wholly on the mining industry. At present, mining, lumbering, manufacturing and fruit ranching are the chief industries and the city is also the main distributing centre for the Kootenay and Boundary districts. The city is underlain by granitic rocks of the Nelson batholith near the northern edge of an area of the rocks of the Rossland group. The latter also appear in small isolated patches throughout the main area underlain by the batholith. The ore deposits are all later than the intrusion of the granodiorite batholith, and younger than the last evidences of igneous activity which form a system of lamprophyric dikes cutting and faulting the ore bodies. The country in the vicinity of Nelson is rather widely mineralized, the principal deposits being gold-silver, silver-copper, silver-lead, and copper-gold-silver. The chief mines working at present are the Granite-Poorman (gold), Silver King (silver-copper), Molly Gibson (silver-lead), and the Eureka and Queen Victoria (copper-gold-silver). The total production of the mining division to the end of 1911 amounts to rather more than $10,700,000 in value.

and the City of Nelson power plant developing 2,350 h.p. The former company supplies power and light to various points in West Kootenay and the Boundary districts, particularly to the mining and metallurgical centres at Trail, Rossland, Grand Forks, Phoenix and Greenwood.''

**Granby.**—From Nelson the geologists' special proceeded to Grand Forks where the smelter of the Granby Consolidated Smelting and Power Company is situated,

**Granby Consolidated Co's Knobhill-Ironsides mine at Phoenix, B.C.
Barring down loose in open stope**

''Four miles west of Nelson the railway crosses to the north side of Kootenay river. The Kootenay from Granite to Castlegar, 22 miles, where it joins the Columbia, has a fall of 335 feet, and is characterized by swift-flowing reaches, falls and rapids. The most important falls are at Bonnington, where it is estimated that under a 40-foot head 267,000 h.p. can be developed at low water. At present there are two plants, the West Kootenay Power and Light Company with 20,000 h.p. developed,

then to Phoenix and the Granby mine. After viewing the open workings the party went underground through some of the large stopes. The ore is low grade, but has been very cheaply mined and treated, so that Granby has been for several years one of America's large copper mines. A few years ago the manager reported serious falling off in reserves and for a time the company's prospects looked anything but bright. Another property, however, has been acquired at Hidden Creek. This is

The glory-hole, Granby Co's Knobhill-Ironsides mine, Phoenix, B.C.

proving up very satisfactorily, and is counted on to produce a large tonnage of higher grade ore than that at the old mine. A description, by Mr. O. E. Leroy, of the latter property, was given in the October 1 issue of the Journal. The new or Hidden Creek property is several hundred miles north of Phoenix, and was not visited by the party. A smelter is being built at Granby bay for this new mine.

**The Granby Mines.**—The properties of the Granby Consolidated Mining, Smelting and Power Co., at Phoenix have for years been large producers of copper ore. The mines operated are the Gold Drop and Ironsides. On June 30, 1913, the former had produced 1,091,598 tons and the latter 8,144,684 tons, making a total of 9,236,282 tons.

The shipments during the last fiscal year totalled 1,261,088 tons. The smelter treated 1,279,869 tons ore yielding 22,688,614 pounds copper, an average of 17.68 pounds per ton. The ore yielded also 324,336 ounces of silver and 47,266 ounces of gold. The receipts were $4,782,691.20. Expenditures for operations and for some ore purchased totalled $3,568,091.90, leaving a profit of $1,214,599.30.

Mr. C. M. Campbell, assistant superintendent, estimated the ore in sight on July 1, 1913, at 5,613,402 tons, 210,402 being credited to the Gold Drop, and 5,403,000 tons to the Ironsides mine.

**Granby Costs**—The costs of mining and treatment of the Phoenix ores are unusually low. The large ore bodies are very economically mined and the average cost for the last year was 75.4 cents per ton, which is the lowest yet reached. The average smelting cost for the year was $1.214 per ton.

The total cost of copper per pound, after deducting value of the gold and silver was 10.6 cents. The average selling price was 16.039 cents.

**Granby's Hidden Creek Property.**—The Hidden Creek mines at Anyox are being rapidly developed and a 2,000-ton smelter to treat the ore is nearing completion at Granby Bay, Observatory Inlet. The officials expect that the plant will be ready to begin operations by the first of the year.

Mr. O. B. Smith, superintendent of the company's mines, reports that there had been developed on July 1, 7,759,550 tons ore, containing an average of 2.2 per cent. copper. Gold and silver contents are estimated at 20 cents per ton of ore.

Victoria shaft, Granby mine, Phoenix, B.C.

There are two ore bodies. At No. 1 the ore developed is estimated at 3,328,400 tons, carrying 151,580,500 pounds copper, or 2.26 per cent. For No. 2 the estimate is 4,431,150 tons, carrying 188,935,600 pounds copper or 2.13 per cent. The bulk of the ore lies above the 385 ft. level only 394,100 tons below this level being included.

(To be continued.)

## BRITISH COLUMBIA COPPER CO.

Information relative to the operations of the British Columbia Copper Co. has been published lately in New York and in Western newspapers. The following is an excerpt from the Pioneer, Phoenix, B.C.:

The production of the British Columbia Copper Co., Ltd., for the month of August, 1913, amounted, it is estimated by the company's officials, to 700,000 lbs. of fine copper, 2,400 ozs. of gold, and about 12,500 ozs. of silver. Adding these to the final figures for the earlier months of the year, the company's output for 1913 to date has been as follows:

| | Lbs. Copper. | Fine Ozs. Gold. | Oz. Silver. |
|---|---|---|---|
| August | *700,000 | *2,400 | *12,500 |
| July | 618,379 | 2,413 | 10,262 |
| June | 634,238 | 2,245 | 11,827 |
| May | 618,076 | 1,762 | 8,479 |
| April | 786,624 | 2,210 | 10,955 |
| March | 844,735 | 2,139 | 10,299 |
| February | 668,312 | 1,446 | 8,082 |
| January | 720,260 | 1,488 | 8,621 |
| Eight months | 5,590,624 | 16,103 | 81,023 |
| Year. | | | |
| 1913 | 7,800,000 | *24,750 | 123,000 |
| 1912 | 11,146,811 | 25,863 | 142,025 |
| 1911 | 9,944,987 | ...... | ...... |
| 1910 | 7,143,456 | ...... | ...... |
| 1909 | 6,325,000 | ...... | ...... |

*Estimated.

During 1913, the plant has been operating at only two-thirds of its full capacity.

A conspicuously favourable feature of the figures is the unusually high gold-silver yield from the ores. It will be noted that while the copper production from the ores treated in 1913 is only about two-thirds of that of 1912, the gold and silver yield is very nearly equal to that of the whole twelve-month period a year ago. On the basis of $20 an ounce for gold, and 55 cents an ounce for silver, the monetary return from these sources in 1913 should amount to about $117,650. This sum will reduce the net cost of copper per pound by almost exactly 1.5 cents, representing one of the highest gold-silver yields on record for the British Columbia Copper Co.

The worst "drawback" of the company, and this a "drawback" which is more apparent than real, is its expenditures in taking up new properties under option. The officials realize that no mine lasts forever, and have wisely adopted the sound policy of looking for additional properties while these latter may be cheaply obtained, and while, too, the British Columbia Copper Co. is in a favourable position for bargaining for such properties. In 1912 there was spent $230,000 in taking up new options and exploring and developing them, and similar expenditures in 1913 for about the first six months of the year have amounted to nearly $120,000. It appears that the expenditures for the entire year in this direction will be about $240,000, which will add to the operating cost per pound of copper ore produced, approximately 3.08c. In the past years there have been charged against options and their development, and plant additions, etc., expenditures (based on per pound of copper produced) amounting to 3.08c. in 1912, 2.27c. in 1911, 2.96c. in 1910, and 1.80c. in 1909.

## GOLD ON SIBOLLA CREEK, B.C.

Mention was made in the Canadian Mining Journal of October 1 of a new gold strike on Sibolla creek, southwest of Telkwa, a small town on the Grand Trunk Pacific Railway, from Prince Rupert eastward through British Columbia, and at the junction of the Telkwa and Bulkley rivers. The information which follows was sent from Telkwa to the Vancouver Daily Province:

After ten days, spent on the Sibolla creek placer field, 120 miles southwest of Telkwa, your correspondent reports the following: Three days' sampling of the gravel about Discovery claim, on the creek, resulted in fly-speeks and colours in only one pan out of four. No coarse gold was shown. Below Discovery, for the first three claims, the result was the same, and after that to No. 19 below, the colours became more numerous and not more than one-quarter of the total pannings were barren.

A shaft was being sunk at the time by S. White, I. McCulley, Dave McKenzie, Billy George, and Louis Koltas, in an effort to reach bedrock, and after 12 ft. of a 6 by 6-ft. shaft had been sunk, windlass erected, and the shaft timbered, the water came in in too great a volume so work on all the creek claims ceased.

Attention was then given to the bench claim of Leo McLaughlin and partner, on the north limit of No. 3, below Discovery, but at the time your correspondent left, bedrock had not been reached. However, colours were consistently present all the way down the shaft, which was, at that time, 15 ft. deep, timbered and with windlass erected. Prior to leaving, most of the prospectors left all their spare supplies with this party and they now have provisions for two months. The only others on the ground properly equipped are George Barrett and Joseph Bussinger, who have provisions for four months, and a good outfit, including a rocker. They are staked on the bench and should reach bedrock in the big flat without being seriously impeded by water.

The bench north of Sibolla creek has all been staked, but as far as could be seen, no active development had been done, except an 8-ft. hole, sunk by your correspondent on the Newsboy claim, in which fly-specks and colours were present after the first 3 ft. The wash here is very deep, and at the bottom of the hole the conglomerate gravel, slightly cemented, is moist and full of air spaces, but pay dirt is not likely to be found until a strata more dense and less coarse has been reached.

On the bench due west of the camp some promising ground was seen marked with dry water courses and sedimentary in character. Here the gravel at 3 ft. deep is very fine and heavily cemented, but no pay was discovered, though colours were fairly plentiful, with a large proportion of white iron and some black sand. A dozen claims have been staked on this ground.

Contrary to the first report, no contact of a slate and porphyry was seen, but a shale or coarse slate runs parallel with the porphyry along the range and dips into it at an acute angle. The large rounded boulders so plentiful in the wash are mainly grey and blue granite, and rose quartz is plentiful in the gravel with an occasional small specimen of native gold in some of the larger pieces. The field shows no sign of having been an ocean beach, but rather resembles the bed of a lake, or what is more probable, glacial detritus, and the characteristic surface boulders stretch for a distance of more than 12 miles, intersected with swamps, mainly with a gravelly bottom. The three beaver dams which have to be crossed in reaching Sibolla creek show considerable signs of wear, and horses with packs will not be able to reach the field should rain fall this month. The water at present above the dams is low and the frost has been very severe the past week.

Andy Goodwill and partner, one of the original locators, were met with on our way out, and had with them four packhorses and expect to put in the winter on No. 1, below Discovery, where the first coarse gold was taken out, and C. P. Price, also one of the original locators, is now outfitting here for the same purpose. Price states that coming out by a new trail from the Sibolla country he discovered on the same range about 12 miles north a similar creek to the Sibolla, fairly plentiful with colours, bearing out our own observations.

More than 300 claims have been staked, but with one exception no party of prospectors have been outfitted properly to reach bedrock in what is, to all surface appearances, a most promising field. If the men at present on the ground fail the value in the field in all probability will not be ascertained until next year.

The actual time occupied in going in from Telkwa was six and one-half days and time in coming out, travelling light, five days.

# OIL AND GAS OF THE NORTHWEST PROVINCES*

By Wyatt Malcolm

The plains of Western Canada are underlain by a great body of sediments, nearly horizontal in attitude, and resting on a Pre-Cambrian base. The eastern contact between the Pre-Cambrian rocks and the later formations runs in a generally northwest direction from Lake Manitoba past Athabaska, Great Slave, and Great Bear lakes. In the eastern part of the plains a great unconformity exists between the Paleozoic systems, consisting of limestones, dolomites and shales, and the Cretaceous system, consisting of shales and sandstones, so that we find the Dakota sandstones of the Cretaceous system resting directly upon limestones of the Devonian system. The paleozoic strata are exposed by faulting in the Rocky mountains and much of the later sediments has been eroded, only traces of the lower members being left. In the west, deposition during Carboniferous, Triassic, and Jurassic times has to a great extent bridged over the unconformity seen in the east. The geological column includes formations from in nearly all the great systems from the Cambrian to the Recent. In western Alberta and in some parts of south Saskatchewan the Cretaceous sediments are overlain by Tertiary deposits. Overlying all is a mantle of unconsolidated Pleistocene and Recent deposits.

Little has been done yet to test the gas and oil possibilities of the district. A few wells have been sunk, and in a number of these gas in commercial quantities has been struck. Prospecting for oil has been less successful.

Prospecting for oil has been carried on in two different areas in the Pincher Creek district, southwestern Alberta, one on the south branch of the south fork of Oldman river, and the other on Oil creek, which flows into Waterton lake. This has apparently resulted in no great measure of success. In northern Alberta the Dakota sandstone, where exposed along the Athabaska and its tributaries, is impregnated with a bituminous substance believed to be a petroleum product, and it is thought that liquid petroleum exists in this porous rock at some distance from the outcrop. To test the validity of this belief, wells were drilled during the nineties by the Dominion Government at Victoria on the Saskatchewan, at Athabaska Landing, and at the mouth of Pelican river. In the first two wells the Dakota sandstone was not reached, while in the last it was reached at a depth of 750 feet, penetrated about 87 feet, and found to carry maltha or heavy, tarry petroleum.

Prospecting for gas has been much more encouraging. The boring at the mouth of Pelican river, although disappointing so far as oil is concerned, proved the presence of a great reservoir of gas in the Dakota sandstones, and heavy flows were struck at 820 and 837 feet. In southern Alberta, also, gas is found in paying quantities. A good field exists at Medicine Hat, and flows have been obtained at several different points west of that city. At Bow island a flow of several million feet is obtained.

Thus, while the presence of oil in commercial quantities remains to be proved, boring operations have demonstrated beyond a doubt the existence of large reservoirs of natural gas, and it seems probable that further exploratory work throughout the wide area underlain by the Cretaceous rocks should lead to the discovery of other reservoirs.

It is believed that the Devonian limestone is the source of the gas and petroleum products of northern Alberta, while the porous Dakota sandstone forms the reservoir into which they have risen and in which they have been retained by the overlying shales. The Dakota sandstone is the productive formation at the mouth of Pelican river, and it is also believed to be the gas-bearing formation at Bow island in southern Alberta. As the Devonian limestone and Dakota sandstone are of wide distribution and probably underlie the western part of Manitoba and a great part of Saskatchewan and Alberta, the prospects for the discovery of other gas fields seem favourable. On account of the great thickness of sediments overlying these formations, the driller, however, must be prepared to go to a considerable depth.

*Extract from memoir No. 29-E., published by the Geological Survey of Canada, 1913.

## TREATMENT OF ZINC ORES.

The Daily News, Nelson, B.C., last month published the following: "Declaring that the problem of the treatment of complex zinc ores had been solved and that he was willing to demonstrate the process, F. B. Allan, of Toronto, has written to the Nelson Board of Trade. The process of which he writes will save all the metals in the ore, he declares in a letter read at a meeting of the Board, at a cost of about $2 a ton. He suggests that from $15,000 to $20,000 should be raised to erect a plant on a commercial basis. The secretary was instructed to take the matter up with the British Columbia Mining Association."

# COAL MINING IN BRITISH COLUMBIA*

By Wm. Fleet Robertson, Provincial Mineralogist.

The year 1912 proved to be, as far as statistics of production will show, one of the most successful in the history of coal mining in British Columbia. During this year the total gross production of coal made in the Province was 3,025,709 tons (2,240 lbs.) of coal, which is only some 113,526 tons short of that of 1910, which is still the "record year" in coal mining. Had it not been for the labour troubles, occurring in the later months of 1912, at the mines of the Canadian Collieries on Vancouver Island, whereby that company's output was reduced to a point 150,000 tons lower than the preceding year, there is little doubt but that 1912 would have been the record year to date, instead of occupying, as it does, only second place; yet, with the exception noted, it is greatly in advance of any other year.

The total sales of coal made in 1912 amounted to 2,230,565 tons (2,240 lbs.), of which 1,263,427 tons was sold in Canada, practically all in British Columbia; 858,981 tons was exported to the United States, including Alaska; while 108,157 tons was exported to other countries. The coke sales of the Province for the year amounted to 267,564 tons (2,240lb.), of which 217,307 tons was sold in British Columbia and 50,257 tons exported to the United States.

The following table shows, for the past six years, the output and the per capita production of the various districts:

better equipment, and greater volume of output. The figures given for 1911 are the actual statistics for that year, but they are in a way misleading for comparison with other years as regards the per capita production of the whole Province and of the East Kootenay field, since during that year the collieries of this latter field closed for eight months owing to labour troubles, while in the Coast District they represent a full year's work. In the Coast District the effectiveness of the employee, both total and underground, has not altered very materially in the last three years, and is considerably lower than in the East Kootenay District. In the East Kootenay field the effectiveness of the total employees has increased from 439 tons in 1910 to 523 tons in 1912, while the per capita output of the underground employee has similarly increased from 575 tons to 708 tons, a very remarkable and encouraging improvement.

**The Coalfields of the Province** which are at present producing may be divided into two main divisions—those of the East Kootenay District and those of the Coast District. These fields from their geographic positions—the one at the extreme eastern boundary of the Province, and the other at the extreme western edge—are in no way competitors in the market, their markets being quite separate and ruled by completely different conditions.

**The Market of the East Kootenay Field** is provided primarily by the railways of the south-eastern part of the Province and of the northern parts of the adjoining States of Montana and Washington, approximately two-thirds of the coal sold as such being exported to those States, while the other third went to supply the demands of the south-eastern part of the Province—its domestic needs, its railways, steamboats, mines, and smelters.

Coke, a product of the coal mines, is sold in the same markets, with the difference that the local consumption—chiefly by the smelters of Trail and the Boundary

**Local Production of British Columbia.**

| Year. | District | Gross tons of coal mined | Total No. of employees at colliery | Tons of coal mined per employee | No. of men employed underground | Tons of coal mined per underground employee |
|---|---|---|---|---|---|---|
| 1907 | East Kootenay District...... | 876,731 | 2,290 | 383 | 1,527 | 574 |
| | Coast District .............. | 1,342,877 | 2,769 | 356 | 2,862 | 469 |
| | Whole Province ............ | 2,219,608 | 2,959 | 366 | 4,389 | 506 |
| 1908 | East Kootenay District...... | 883,205 | 2,524 | 350 | 1,746 | 506 |
| | Coast District .............. | 1,226,182 | 3,549 | 345 | 2,686 | 456 |
| | Whole Province ............ | 2,109,387 | 6,073 | 347 | 4,432 | 476 |
| 1909 | East Kootenay District...... | 923,865 | 2,427 | 380 | 1,737 | 532 |
| | Coast District .............. | 1,476,735 | 3,991 | 370 | 2,976 | 496 |
| | Whole Province ............ | 2,400,600 | 6,418 | 374 | 4,713 | 509 |
| 1910 | East Kootenay District...... | 1,365,119 | 3,111 | 439 | 2,374 | 575 |
| | Coast District .............. | 1,774,116 | 4,647 | 382 | 3,529 | 502 |
| | Whole Province ............ | 3,139,235 | 7,758 | 404 | 5,903 | 532 |
| 1911 | East Kootenay District...... | 442,057 | 2,197 | 201 | 1,585 | 272 |
| | Coast District .............. | 1,855,661 | 4,676 | 397 | 3,627 | 511 |
| | Whole Province ............ | 2,297,718 | 6,873 | 334 | 5,212 | 440 |
| 1912 | East Kootenay District...... | 1,261,212 | 2,410 | 523 | 1,780 | 708 |
| | Coast District .............. | 1,764,497 | 4,720 | 374 | 3,495 | 504 |
| | Whole Province ............ | 3,025,709 | 7,130 | 424 | 5,275 | 574 |

**Per Capita Production**—While no figures can be given as to the actual cost of mining in the different fields, the per capita production of these fields is of interest, as having a bearing upon the working costs and as indicating the mining facilities existing and the improvement made in these conditions from year to year. It will be seen from the above table that the production per capita has steadily and materially increased during the past three years. This increased effectiveness of the labour employed is largely due to better methods,

*Extract from Annual Report of the Minister of Mines, 1912.

District—takes over 80 per cent. of the product, while 20 per cent. is exported to the States mentioned.

As regards the marketing conditions in this field, the East Kootenay collieries are, however, brought into direct competition with the collieries of Alberta just over the Provincial boundary-line, all these collieries being in the same coalfield, with practically the same grade of coal and working under similar conditions.

This competition has kept the price obtainable for coal at from $2.25 to $2.50 a ton, with little probability of any material increase in price, owing to the facility with which new collieries can be opened up and the very large reserve areas of coal limits in that district; a description of these reserves was given in the Report of this Bureau for the year 1909.

**The Coast District** may be subdivided into two fields —the Nicola-Princeton field and the Vancouver Island field—in which the markets differ considerably. In the former field the consumption is chiefly by the local railways, while a small amount finds its way to Vancouver, even under the handicap of what seems to be an excessively high freight charge.

**The Vancouver Island Coal Market** is provided by the domestic and manufacturing requirements of the coast cities, and of the ocean-going steamers calling at these ports. The demand for coal from the larger coasting steamers and from the railways has in the past couple of years diminished, as the Canadian Pacific Railway main line engines are nearly all burning California crude oil, and a large coasting steamer burning coal is now an exception. Notwithstanding the heavy consumption of crude oil, the coal sales have remained about constant, approximately 70 per cent. of the coal sold being for use in British Columbia, 20 per cent. exported to the United States, and 10 per cent. to other countries, chiefly Mexico. In the Coast District the demand for export coal has been so great and constant, particularly on the seaboard, and the prices obtainable so satisfactory to the shippers, that it has permitted of the domstic price being kept at a figure so high as to admit of the importation from California of fuel oil as a competitive fuel, where conditions permit of its use. It would appear, therefore, that the present price of coal on the seaboard, of from $4 to $4.50 a ton f.o.b., is not liable to decrease for some time.

**Producing Mines**—As in former years, the greater proportion of this product was made by three larger companies—the Crow's Nest Pass Coal Company, with two collieries in East Kootenay, and by the Western Fuel Company, of Nanaimo, and the Canadian Collieries, Limited, formerly the Wellington Colliery Company, these last two operating on Vancouver Island.

In addition to these larger shippers, very appreciable shipments have been made by the Hosmer Mines, Limited, and the Corbin Coal and Coke Company, in East Kootenay; by the Nicola Valley Coal and Coke Company, the Diamond Vale Collieries, and the Inland Coal and Coke Company, all of the Nicola Valley; by the Princeton Coal and Land Company, of Princeton; and by the Pacific Coast Coal Mines, Limited, and Vancouver & Nanaimo Coal Mining Company, both operating on Vancouver Island, near Nanaimo.

**Consumption.**—During the year 1912 about 56.65 per cent. of the coal, sold as such, by the collieries of the Province was consumed in British Columbia; about 38.51 per cent. was exported to the United States, including Alaska; and 4.84 per cent. was exported to other countries, chiefly to Mexico. Of the coke sold, about 81.23 per cent. was consumed in British Columbia, and the remaining 18.77 per cent. was exported to the United States.

## PLANT ORDERED FOR BRAZEAU COLLIERIES.

The Roberts and Schaefer Company, engineers and contractors, Chicago, U.S.A., through their president, Mr. Warren R. Roberts, secured a contract on October 7th for a complete coal mining plant for the Brazeau Collieries, Ltd., of Toronto, Canada, on the lump sum basis, aggregating approximately $185,000.00.

This modern mining plant will open up the recently acquired coal acreage of the Brazeau Collieries, Ltd., at Nordegg, Alberta, Canada.

This company is owned jointly by Mackenzie, Mann & Co., Ltd., who control the Canadian Northern Railway; Mr. Martin Nordegg, vice-president; and a firm of Belgian bankers who are represented by Mr. Ernest Gheur, consulting engineer of the Brazeau Collieries, Ltd., and Mr. H. Prudhomme, their Canadian representative, treasurer of the coal company.

The Canadian Northern Railway Company has practically completed a line 160 miles long to Nordegg, at the site of the mines.

The plant will be one of the most extensive in the Canadian field, and will consist of a modern mine tipple with box car loader; dump house from two slope coal mines with conveyor delivering coal to tipple; complete boiler plant, including boiler coal conveyor; combined generator house and repair shop, including electric transformers; combined carpenter and blacksmith shop; warehouse; two mine fans; mine office building; boarding house; miners' wash house; two railroad track scales; commissary building; complete steam and water piping for the entire equipment, and all electric wiring.

The Roberts and Schaefer Company has guaranteed to complete this entire installation in the fall of 1914, which will require the early ordering of material preparatory to starting the construction work in the spring.

## NIPISSING LOW-GRADE MILL

Mr. James J. Denny, writing in the Mining and Scientific Press, September 27, 1913, gives the following description of this mill:

The Nipissing low-grade mill is at Cobalt, Canada. The high-grade ores of this property have been treated for the last three years in the high-grade mill by an amalgamation and cyanidation process yielding the silver content directly as bullion.

The object of the new low-grade mill was to treat the low-grade wall rock by cyanidation and likewise recover the silver in the form of fine bullion. The mill was designed and constructed by James Johnston, of the Butters Engineering Co., and owes much of its success and smoothness of operation to his experience and foresight. Operations on a small scale were commenced on November 16, 1912, and after a short period of minor adjustment started at full capacity. Up to the present it has continued to run with gratifying success.

The rock is mainly the Cobalt series of conglomerate and is very hard and tough. The following is an analysis of the average run of mine ore:

| | Per cent. | | Per cent. |
|---|---|---|---|
| Ag | 0.106 | Pb | 0.064 |
| Cu | 0.270 | CaO | 9.020 |
| As | 1.880 | MgO | 4.330 |
| Fe | 1.920 | $Al_2O_3$ | 10.030 |
| S | 0.640 | $CO_2$ | 11.060 |
| Bi | 0.010 | Insolubles | 59.840 |
| Ni. and Co. | 0.73 | Hg | Trace |

**The washing plant,** where the ore is crushed in breakers and given a preliminary jigging treatment, is not a part of the mill proper, as the concentrate from this section is credited to the mine. The ore from the mine averages about 60 ozs. per ton, and the tailing from the washing plant as sent to the mill proper averages about 28 ozs. per ton.

**In the mill proper,** the ore is crushed by stamps in a 0.25 per cent. solution of caustic soda, lime being added to the extent of 5 lbs. per ton of ore. The lime is used merely for settling, to facilitate subsequent decantation of clear solution back to the battery storage tank, the alkalinity for cyanidation treatment being furnished by the caustic solution. The fine grinding is effected by a closed system of tube-mills and classifiers, two of the tube-mills being used to regrind the battery discharge, and the other two for the ultimate fine grinding. Of the final product, only 5 per cent. remains on a 200-mesh screen, 16 to 20 per cent. is a fine 200-mesh sand, and the remainder an impalpable slime. After settling and decanting the solution, the thickened slime passes on to the reducing treatment.

The pulp is given a preliminary desulphurizing treatment by being passed through a tube-mill which is charged with aluminum ingots. The final treatment is given by lining the filter stock tank with aluminum plates and agitating for about ten hours by mechanical means. From the stock tank the pulp is drawn off by the filters as required. After filtering, the cake carries 26 per cent. alkali solution as moisture, and is thence discharged without washing to the cyanide tanks.

**The cyanide treatment** consists of agitating the pulp for 48 hours in a 0.25 per cent. cyanide solution, dilution 2.5:1. The pulp is then settled, the excess solution decanted, and after being again agitated the pulp is pumped to the stock tank for filtering.

As already mentioned, the pregnant solution is precipitated with aluminum dust. The details of the mill practice, together with a statement of costs, are included in the article by E. M. Hamilton. The precipitate is then sent to the refinery of the high-grade mill, where it is melted in a reverberatory and refined, the bullion averaging 999 fine.

When the process was first put into operation, the mechanically agitated stock tanks were depended on for the desulphurizing treatment. Here the aluminum plates were soon found to form a coating which was thought to be a calcium aluminate, and the reducing action was seriously retarded. To overcome this difficulty, the tube-mill charged with aluminum ingots was added. This kept the aluminum clean and bright, but the aluminum consumption was increased as a result of the wear on the ingots. Lately, however, the trouble has been found to be due to impure aluminum containing iron and silica; sheets of pure aluminum are found to remain clean and to have no tendency to form a coating.

Crushing a neutral ore in an alkaline solution is unusual, though not unknown in cyanidation, and the 26 per cent. of the alkali solution passing over with the cake to the cyanidation tanks will be criticized as being contrary to general practice. However, instead of being detrimental as is ordinarily maintained, in this particular case, namely, with Cobalt ores where the native silver is associated with antimony, the addition of alkali to the cyaniding solution has proved to be a decided benefit. Daily tests, running the working mill solution against fresh cyanide solution, show in every case an increased solvent power of from 0.2 to 0.5 ozs. of silver per ton of ore in favour of the mill solution. In this connection, the behaviour of the mineral dyscrasite is interesting. As mentioned at the beginning of this article, the reducing treatment has no effect on this mineral, probably due to the fact that it is a complex of variable composition of the metals, silver and antimony, and does not contain sulphur. However, the results from treating this mineral by plain cyaniding, compared with the results of similar treatment, after the preliminary reducing treatment, show a decided advantage in favour of the latter, owing to the beneficial action of the caustic soda solution during cyanide treatment. A further advantage of the caustic in the cyanide solution is the fact that it is necessary to precipitation with aluminum dust and saves the addition of caustic at that point.

**The outstanding essential principles** of the practice followed at the Nipissing low-grade mill are, therefore: (1) The extremely fine grinding; (2) the preliminary reducing treatment before cyanidation; (3) the use of aluminum-dust precipitation. In July the mill treated 234 tons per day of 27-oz. ore, and below the stamps made an extraction of 93.16 per cent. actually recovered in bullion.

As the mill has been running less than a year, the compiling of representative figures showing costs is a matter of difficulty. In connection with the desulphurizing treatment, treating 7,268 tons per month, the following data are available:

**Collecting, Desulphurizing, and Transferring of Pulp.**

| | Per ton. |
|---|---|
| Labour | $0.050 |
| Supplies (aluminum, 0.81 lbs.; caustic soda, 1.46 lbs.; lime, 5 lbs.) | 0.347 |
| Power | 0.027 |
| Workshop | 0.008 |
| Total | $0.432 |

**Alkali Solution, Filtering and Transferring.**

| | Per ton. |
|---|---|
| Labour | $0.069 |
| Supplies | 0.006 |
| Power | 0.028 |
| Workshop | 0.002 |
| Total | $0.105 |

The desulphurizing treatment effects a saving of from one to four ounces per ton, depending on the amount of refractory minerals present, at a total cost of 54c. per ton.

## NIPISSING.

The following is a brief financial statement of the affairs of the Nipissing Mining Co., Ltd. (the Operating Company) as of October 1st, 1913:

| | |
|---|---|
| Cash in bank | $1,169,511.93 |
| Ore and bullion in transit | 55,464.64 |
| Ore on hand and in process and bullion ready for shipment | 158,491.00 |
| | $1,383,467.57 |

## DRUNK ON SHIFT.

Before Magistrate Brodie, James Bourtin, shift boss at the Murray mine was fined $15 and costs, and George Farrell, hoistman at the Murray mine, was fined $20 and costs for being drunk on shift the night of September 16th. Information was laid by Mr. T. F. Sutherland, inspector of mines for Ontario.

## THE MOFFAT-IRVING ELECTRIC STEEL FURNACE

Two years ago Messrs. James W. Moffat and Thomas C. Irving, Jr., erected in Toronto an electric smelting plant for the manufacture of steel castings. The smelter has now been in successful operation for some time and the company is supplying high grade castings to a number of customers in the city.

As the iron is largely derived from material which cannot be recovered in the ordinary blast furnace, the process has a special interest. Its successful application is a notable achievement. The raw material is flue dust and other furnace fines, containing about 42 per cent. iron. This is concentrated by treatment on a magnetic separator and then smelted in an electric furnace with limestone and coke. After being in the furnace for a period varying from 3 to 5 hours, the metal is drawn off into a ladle, and then poured into the moulds.

**The Charge**—With 1,000 pounds ore there is charged about 400 pounds limestone and 100 to 200 pounds coke. The coke and limestone are both first crushed to pass ⅛-inch screen. Coke breeze is used.

The crude ore contains about 42% iron. By magnetic separation a product containing 66 to 68% iron is obtained. This is then fed into the furnace. The sulphur content of the ore varies from .08 to .25% and the phosphorus from .15 to .3%.

**Method of Charging**.—Above the furnace are three bins for ore, coke and limestone respectively. From the ore bin the ore runs down by gravity to a hopper on the side of the furnace shaft. From this small hopper the ore is fed automatically into the furnace by a screw. An electric attachment records the number of turns of the screw. It has been found that by keeping the hopper full a very steady feed is obtained. The gravity feed from the large hopper gives the required regularity by keeping the small hopper full. The limestone is fed also near the top of the shaft in the same manner as the ore. The coke is introduced at the bottom of the shaft.

**Reduction of the Ore**.—There is an evolution of carbon monoxide at the bottom of the shaft. The ore coming down the shaft meets a strong current of reducing gas and reduction of the oxides takes place in the shaft.

Near the end of the run a determination is made of the amount of carbon in the steel. The coke feed is then regulated to give more or less carbon as desired.

The heat is produced by a current of 2,000 to 2,500 amperes passing through each of three graphite electrodes which are worked at a potential of 80 volts. The electrodes are set 120° apart and converge downwards. In the bath they are about 24 inches apart. The electrodes are controlled by hand. The current is delivered to the plant at 12,200 volts. This is stepped down to 80 volts by a Packard 300 k.w. transformer.

**The Steel**.—The remarkable control over the entire operation of steel making in the electric furnace makes it possible to produce steel of the highest grade. The usual analysis is: Carbon, 0.25 to 0.35; silicon, 0.27 to 0.32; manganese, 0.65 to 0.70; sulphur, 0.030 and lower; phosphorus, 0.040 and lower.. Under physical test this steel has shown an ultimate tensile strength of 80,000 to 100,000 lbs. per square inch, and an elastic limit of 45,000 to 60,000 lbs.

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### INTERNATIONAL NICKEL CO.

N. Y.—Business of International Nickel Co. continues at a level sufficient to maintain earnings during current fiscal year at about the same high rate as obtained in 12 months ended March 31 last, when gross aggregated $6,800,000. A recession in business had been expected some months back, but the six months ending with September, being the first half of current fiscal year, have not been in accord with that forecast.

July was a quiet month, as is not unusually the case, but business in August was much better and bookings this month have been such as to indicate active operations for some time to come.

The feature of the company's business most pleasing to those interested is the enlarging demand for nickel for commercial purposes as against demand for use in munitions of war. Probably the latter use now absorbs only half of metal produced by International Nickel.

Should gross earnings of Nickel Co. during the current fiscal year equal those of last year surplus available for dividends should exceed that of the last year as result of retirement of the entire outstanding funded debt. Bond charges in the year ended March 31, 1912, amounted to $445,650; on that date bonds outstanding totalled $8,162,154. The sums formerly paid out in interest charges now go to swell surplus for dividends.

In the last fiscal year International Nickel's expenditures for new construction were very heavy, bringing total spent for new construction in 11 years to over $9,600,000. In the current year to date expenses of new construction have been much lighter, but if the outlook for business is as bright at the close of this year, the succeeding fiscal year will probably see a resumption of new construction on a heavy scale. Expenditures for this purpose since incorporation compare as follows:

| Year to March 31. | New construction: |
|---|---|
| 1913 | $1,323,276 |
| 1912 | 951,294 |
| 1911 | 1,160,486 |
| 1910 | 238,840 |
| 1909 | 269,190 |
| 1908 | 1,548,482 |
| 1907 | 1,390,071 |
| 1909 | 369,190 |
| 1905 | 716,378 |
| 1904 | 645,895 |
| 1903 | 225,435 |
| Total | $9,600,208 |

The usual semi-annual inspection by directors of the company's properties will be made early in October.—Boston News Bureau.

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### GYPSUM.

The Great Northern Mining & Railway Company, Eastern Harbour, C.B., has passed into the control of Montreal capitalists, headed by J. A. Davis & Co. The new owners have incorporated a company under the name of the Cheticamp Gypsum & Plaster Co., to operate the properties which include mill, railway, quarries, wharves, etc. The quarries are estimated to contain an enormous tonnage of gypsum.

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The U. S. Bureau of Mines has issued a bulletin on First-Aid Instruction for Miners. The publication contains sections on: a simple description of the anatomy of the human body, common injuries and their treatment, bandages, dressings, and transportation of the injured. It is an excellent handbook for the first-aid man and can be read with profit by anyone.

# COPPER MINING IN MICHIGAN

By Reginald E. Hore.

(Continued from last issue.)

**Dividends.**—During 1912 the dividend-paying mining companies paid to shareholders $9,901,875, and added considerable amounts to surplus account. Ahmeek, Baltic, Calumet & Hecla, Champion, Mohawk, Osceola, Quincy, Trimountain and Wolverine all paid larger dividends than in 1911. Dividends paid for the past five years and to date have been as follows:

**Dividends Paid by Michigan Copper Companies.**

| | 1908. | 1909. | 1910. | 1911. | 1912. | All Years. |
|---|---|---|---|---|---|---|
| Ahmeek | ........ | ........ | ........ | 100,000 | 900,000 | 1,000,000 |
| Atlantic | ........ | ........ | ........ | ........ | ........ | 990,000 |
| Baltic | 90,000 | 1,000,000 | 1,000,000 | 500,000 | 700,000 | 7,750,000 |
| Calumet & Hecla | 2,000,000 | 2,700,000 | 2,900,000 | 2,400,000 | 4,200,000 | 120,050,000 |
| Central | ........ | ........ | ........ | ........ | ........ | 2,130,000 |
| Champion | 500,000 | 500,000 | 900,000 | 500,000 | 1,100,000 | 7,500,000 |
| Cliff | ........ | ........ | ........ | ........ | ........ | 2,518,620 |
| Copper Falls | ........ | ........ | ........ | ........ | ........ | 100,000 |
| Franklin | | ........ | ........ | ........ | ........ | 1,240,000 |
| Kearsarge | ........ | ........ | ........ | ........ | ........ | 160,000 |
| Minesota | ........ | ........ | ........ | ........ | ........ | 1,820,000 |
| Mohawk | 250,000 | 300,000 | 200,000 | 150,000 | 350,000 | 2,650,000 |
| Osceola | 192,300 | 769,200 | 961,500 | 721,125 | 1,201,875 | 10,881,650 |
| Quincy | 495,000 | 440,000 | 412,500 | 440,000 | 550,000 | 20,430,000 |
| Tamarack | ........ | ........ | ........ | ........ | ........ | 9,420,000 |
| Trimountain | 500,000 | ........ | 150,000 | ........ | 300,000 | 1,250,000 |
| Wolverine | 600,000 | 600,000 | 600,000 | 540,000 | 600,000 | 7,440,000 |

In 1912, Copper Range Consolidated, from profits made by ownership of shares of Baltic, Trimountain and Champion mining companies, distributed $787,382. St. Mary's Canal Mineral Land Co., from profits made from half ownership of Champion Copper Co. and from sales of land, distributed $480,000 to shareholders.

**Increased Wages.**—Soon after the higher prices became established, the Michigan copper companies increased the wages of the miners. The increase, amounting to about 10 per cent. at most mines, was made voluntarily, and reflects a willingness on the part of the owners to share profits with employees. During the four lean years, wages were necessarily low, and yet plenty of men were available. In spite of the higher wage offered, there has been considerable difficulty in maintaining efficiency during 1912. Good men being not always obtainable, the companies have been compelled, in many cases, to keep on their rolls an unusually large percentage of poor and inexperienced workmen. Inability to secure suitable men has made it impossible to run some of the mines at their usual rate, and, as a result, there has been a natural increase in cost per ton due to lower production, as well as an increase due to the higher wage. Costs per pound of copper were from one-fourth to one-half cent higher than in 1911. This is largely to be charged to labour, though greater expenditure for construction has materially increased costs at some mines.

**One-Man Drilling Machines.**—The increased wage has in some cases not been reflected in higher costs, owing to many of the best miners having increased in efficiency. Using better machines and operating and caring for them more intelligently, the miners can earn larger wages while decreasing the cost per ton. The one-man drills, which have only recently been largely in use, have proved remarkably successful. The use of these drills has enabled the companies to pay higher wages than would otherwise be possible, as the saving in labour is larger than the increased cost of supplies and repairs. Good miners are, consequently, earning much higher wages than the companies could afford to pay under the old conditions.

**Efficiency Engineers.**—At several mines, graduates of the Michigan College of Mines and other colleges are employed as "efficiency" engineers. These men have themselves worked as miners and devote their attention to improving underground practice. They instruct the miners in use and care of the machines, study and compare costs of different methods of mining and handling the ore and guard against waste of air and supplies.

**Mining Methods.**—The methods of developing and mining the lodes were described in the January 1 issue of the Journal, in which was published some extracts from the writer's report on the copper industry made for the Michigan Geological Survey.

**The One-man Drill.**—One of the most noteworthy changes in mining practice in recent years has been the adoption of lightweight (150 pound) one-man drilling machines to replace the heavy (290-pound) two-man machines which were long in use.

Concerning these drills, the superintendent of one of the mines stated to an investigating committee recently:

"The necessity for further close economy in the operation of our mine forced us to go into the market for a more efficient drilling machine, and, if possible, a machine that could be operated with one man as compared with two, which was standard practice. After about eighteen months of experimenting we adopted our present machine. Our intention was to divide the benefits accruing to us from the use of the one-man machine with the men. This benefit to take the form of higher wages to machine operators (called miners), That we have carried out this plan is shown by the following table which shows the increase in wages to the men operating one-man drills over wages made when operating two-men drills: in case a man does not make what we call a fair rate he is paid off at a rate of not less than sixty-five dollars per month, but this ruling effects a very small portion of our employees. In fact, for the month of June this

**Comparative Statistics on One-man Drill and Two-man Drill Calumet & Hecla and Subsidiary Mines for Year Ending December 31, 1912.**

| | Shifts. | Labor Cost. | Supplies. | Total. | Average wage per shift. |
|---|---|---|---|---|---|
| Two-man drill ......................... | 350,012 | $1,024,801.84 | $291,526.14 | $1,316,327.98 | $2.83 |
| One man drill ......................... | 54,758 | 193,935.81 | 94,058.24 | 287,904.05 | 3.34 |

**One-man (Leyner) drill, 59th level, Conglomerate lode.** Photo by O. Gardner
**Calumet and Hecla mine, Calumet, Mich.**

"The miners' wages largely depend upon the efficiency of the man as our work is all on the bonus system and is so arranged that increased efficiency is of mutual benefit to the employer and the employee. We have a fixed contract which is not cut as the efficiency of the employee increases. It is also one of our rules that year it was not necessary to use this minimum wage for a single employee. The one-man drill has resulted in a decided increase in efficiency, which, with further experience, will increase and will result in not only lower costs, but in higher wages to the men. What is more, the drill is popular with the good miners and any sentiment against it is made from without. Any attempt to return to the two-man drill would be a backward step in industrial progress and would work untold hardship to this district in its competition with other copper-producing districts. It is as little to be thought of as the elimination of any other labour-saving device. If copper mining in Michigan is to be a progressive and permanent institution, we must shape our methods now to be able to work deposits of a still lower grade than month of May, 1913, the companies under Calumet and Hecla management paid miners $3.47 and trammers $2.87.

**Number of Employees.**—On July 22, the day before the strike was declared, there were 14,300 men in the employ of the mining companies. The chief employers were Calumet and Hecla 4,107, Copper Range Consolidated 2,716, Quincy 1,483, and Osceola 1,143.

On October 8, 1913, there were 5,445 men at work.

**One-man (Leyner) drill, 59th level, Conglomerate lode.** Photo by O. Gardner.
**Calumet and Hecla Mine, Calumet, Mich.**

have been worked up to the present time, and the one-man drill and the further possible increase in the efficiency along this line is the most important step now before us."

**Wages.**—The recent investigation undertaken by the Copper Country Commercial Club shows that in 1912 the companies paid in wages a total of $12,606,409.34, or a little over $1,000,000 per month. For the six months prior to the strike the average wage was $3.20 per shift for miners, and $2.63 for trammers. For the

## GERMAN CONSUMPTION OF FOREIGN COPPER.

Messrs. L. Vogelstein & Co. report for the months January to July, 1913:

| | Tons. |
|---|---|
| Imports or copper | 134,293 |
| Exports of copper | 6,010 |
| Consumption of copper | 128,283 |

as compared with consumption for the same period in 1912 of 120,071 tons.

Of the above quantity 115,349 tons was imported from the United States.

# CANADA'S NICKEL INDUSTRY*

By Alex. Gray.

(Continued from last issue.)

*Precious Metals in the Nickel Copper Ores.*

It is of interest to have the technical advisers of the Canadian Nickel Corporation formally record the fact that they count on recovering precious metals worth $1 per ton of ore. The cost of this recovery always has minimized its net value to other companies. If the Hybinette process will save $1 out of the estimated content per ton of $1.20, then the precious by-products will become an important factor. It has never been contended by the International Company that these precious metals were other than a negligible quantity, in view of what it costs to separate them.

With reference to these precious metals Dr. Coleman states that native gold was early found in the gossan of the Vermilion mine of the International Company. The mine was taken up as a gold mine. Gold was also obtained, soon after, from the Victoria mine of the Mond Company. More gold was found at the Crean Hill mine. Sperrylite, the arsenide of platinum, was originally obtained from the Vermilion mine, and later from the Victoria. The name, Sperrylite, was conferred upon it in honour of Mr. F. L. Sperry, chemist of the Canadian Copper Company, who had sent it to experts for examination. The mean of the two analyses of samples submitted by Mr. Sperry, was:

| | |
|---|---|
| Arsenic | 40.98 |
| Antimony | 0.50 |
| Platinum | 52.57 |
| Rhodium | 0.72 |
| Palladium | trace. |
| Iron | 0.07 |
| Cassiterite | 4.62 |

"The sperrylite of the ores is mainly contained in copper pyrites," says Dr. Coleman. . . . . "This mineral has not been found at the other mines, though the platinum obtained from matte made from their ores suggests that it is really present. It is known that palladium occurs in the Sudbury ores in larger amounts than platinum, but no palladium compound has yet been discovered. The silver, also, is not accounted for unless contained in the copper pyrites."

However, it is manifest that the nickeliferous ores do not all carry anything like the percentage of precious metals determined by Professor George R. Mickle about 16 years ago. He found that gold and the arsenide of platinum were not confined to the Vermilion mine gossan. He located these metals in the unweathered sulphides, both in the pyrite and pyrrhotite. His results must have been exceptional, because "the average of six samples of solid ore gave over 3 dwts. of platinum and a trace of gold, while pyrrhotite with little chalcopyrite gave considerably less than the average, and one sample of ore with much chalcopyrite gave 7 dwts. 12 grs. of platinum and a trace of gold." The highest assay from the Mickle samples, was 1 oz. 3 dwt. of platinum and 3 dwts. of gold, from decomposed ore resting on the solid ore. Of themselves those results would create furore were they at all indicative of the average. They find their quietus in the historical events attending the exploitation of the Vermilion mine as a gold mine, as related by Dr. Coleman:

"The Vermilion was first taken up as a gold mine in 1887, and a shaft was sunk by Messrs. Tough and Stobie on a small quartz vein the following year, on the low ground 930 feet north of the present mine and just beyond the Crean Hill Railway, the name coming from the Vermilion river, which flows 2 or 3 miles to the southeast. A shaft was sunk 40 feet on the quartz vein and some very rich ore (wire gold) was found on the surface and also to some extent in the wall rock. Mr. B. Charlton, president of the Vermilion Gold Mining Co., states that several thousand dollars worth of gold was obtained by means of a three-stamp prospecting mill while sinking the shaft.

"The rich ore presently ran out and then gold was found in the gossan on the hill at the present mine, which was put through the little mill. The men in charge were puzzled to find the carpet used to collect the coarse gold whitened by shining grains of a tin white mineral, afterwards named sperrylite. Since the owners were in search of gold, and not platinum, the mine was sold in 1890 to the Canadian Copper Co.

"It was presently found that the gossan contained palladium, as well as platinum and gold, and the Canadian Copper Company made attempts to dispose of the mineral to various firms dealing in the rare metals, such as Balbach & Co., and Johnson, Matthey & Co. In 1896 the two firms mentioned reported that the ore contained from 6 to 9 ozs. of platinum and from 8 to 14 ozs. of palladium. In 1897 a consignment of 14 casks (5 tons) of platinum sand was made to Johnson, Matthey & Co., who found its treatment a matter of extreme difficulty, as the ore could not be levigated nor treated successfully by any acid process, and in smelting the palladium contents are sacrificed. The platinum contents could be recovered only by smelting with a large proportion of silver ore, involving considerable cost in its subsequent separation. In 1899 they paid for the ore at the rate of £8 per ton, and after deducting various charges, the net return from the consignment was at the rate of $22 per ton. An offer was made to buy the ore at the rate of £9 5s. per ton if quantities of 100 tons or more were shipped: but no more seems to have been sent to them, probably because the price was so low for ore running on the average 7 ozs. of platinum and 11 ozs. of palladium per ton. Platinum was worth about $16.00 per ounce at the time.

"Negotiations were carried on in 1899 and 1900 with a French company on the basis of 35 per cent. of the value of the two metals, palladium to be taken as equal to platinum in value, but apparently without result.

"In 1902 a small amount of platinum sand was sent to the Orford International Works at Bayonne, and in September, according to Mr. A. Wadhams, experiments were carried on under the direction of Mr. Hybinette for the separation of the precious metals. They seem not to have been very successful and finally the material was turned in with the ordinary nickel-copper matte, so that only a small percentage of the platinum metals was recovered.

*From Journal of Commerce.

"In October, 1903, 155.65 tons of 'platinum dirt' was shipped to the Orford works, according to official records at Copper Cliff, and Mr. Browne states that 90 barrels of gossan were removed in 1903, containing 6.88 per cent. copper, and 2.91 per cent. of nickel, with 6.5 ozs. of palladium, 4.1 ozs. of platinum, 4.3 ozs. of silver, and 0.28 oz. of gold per ton.

"Since sperrylite and gold are very easily separated from the gossan by panning, there is no doubt that most of the platinum and gold could have been saved by sluices or cradles, and it is surprising to find Johnson, Matthey & Co., stating that the ore could not be 'levigated.' The source of the palladium is not known, since analyses of sperrylite show only traces of that metal.

"In 1902 the Canadian Copper Company began taking out unweathered ore, sinking the main shaft to about 50 feet and drifting in various directions to follow the ore underground, and there is a record of 198.28 tons having been shipped in February, 1905. This was very rich in nickel and copper, averaging 20 to 25 per cent. of the combined metals. Assays made apparently in 1903, show that the ore contained 4 ozs. of silver, 4 ozs. of palladium, 1.5 ozs. of platinum, and 1/3 oz. of gold per ton.

"An assay of clean chalcopyrite, made by Mr. Waern in the laboratory of the Canadian Copper Co., in September, 1909, showed a trace of gold. 0.79 oz. platinum, 3.62 ozs. of palladium, and 3.78 ozs. of silver—a total of 8.13 ozs. per ton of the precious metals."

In the absence of complete data relating to the past recovery of precious metals from these ores, when dealt with in bulk, possibly there is considerable misconception. The Vermilion and Victoria mines cannot be regarded as indicative of the whole district. Undoubtedly some of the precious contents are saved. Taking certain complete analyses of bessemer matte as a basis, and including other high matte analyses, which showed only traces of palladium and 0.13 oz., 0.50 oz., 0.44 oz., 0.25 oz., and .40 oz. of platinum, Dr. Colesman says: "It came as a surprise to learn that for several years more palladium than platinum was recovered from the Canadian Copper Company's matte during the process of refining at Constable Hook, New Jersey. In 1902 no less than 2,375 ozs. of platinum and 4,411 ozs. of palladium were recovered. doubtless belonging to ore mined in previous years. If it all came from the ore mined in 1902 there were 0.0102 ozs. of platinum and 0.0189 ozs. of palladium, or 0.0291 of the combined metals, per ton of ore. In 1903 the amounts were 0.0077 of platinum and 0.0144 of palladium, and in 1904, 0.0052 ozs. of platinum and 0.0093 ozs. of palladium; showing a rapid falling off, due probably to the fact that Creighton ore had largely replaced others." No platinum, since 1904, has been reported, according to Dr. Coleman; yet another authority claims, without giving his grounds for so doing, that "there were recovered by the Orford Copper Company Works, at Constable Hook—the refining concern of the International Company—in dealing with the nickel-copper mattes shipped from Copper Cliff during the six years ended with 1912, 2,864 ozs. of platinum and 4,986 ozs. of palladium, 15,675 ozs. of gold, and 459,250 ozs. of silver." Lest the data be confusing, however, it is stipulated "that it cannot be specifically stated that this entire production was from the nickel-copper ores since certain residues from other mines are treated along with the matte in the process of refining. Doubtless, however, a large proportion is traceable to the nickel and copper-carrying pyrrhotite. The value of the production was almost $817,030."

At first blush that amount is a handsome extra. Reference to the tonnage smelted in those six years—and recollection of the other "residues" referred to—will dispel the impression that each ton of International ore had had more precious contents than has been commonly supposed. Were all the ore similar to that from the Victoria and Vermilion mine, the per ton precious metal contents would be quite important. But the Vermilion was somewhat incidental to the larger operations at the Creighton and Crean Hill Mines. It is different with the Mond Company, which mined the Victoria mine, almost exclusively, until lately. This leads Dr. Coleman to remark: "Since the Victoria mine in the early days contained so much sperrylite and gold that they could be panned from its gossan, it is probable that the Clydach refinery in which its bessemer matte is treated, must separate important amounts of gold and platinum and also of palladium, though there is no published account of the production of the metals."

### The Alexo Mine.

In 1908 Alex. Kelso discovered a body of ore in Dundonald township, near Matheson, on the line of the Timiskaming & Northern Ontario Railway. Dr. Coleman, while recognizing the limitations of the locality, pronounces the Alexo Nickel mine to be "the most promising recent find of nickel ore in Canada, aside from the Sudbury deposits." No attempt has been made by the present owners, Mr. E. F. Pullen being the president to erect anything in the nature of a smelting plant. Perhaps the tonnage proved thus far does not warrant it. All told, the shipments from the property to July 31st, totalled 2,785 tons. This went to the Mond smelter, the yield in metals as notified by the smelter returns, being:

| | |
|---|---|
| | Contents. |
| Nickel .................... | 241,563 lbs. |
| Copper .................... | 32,565 lbs. |
| | Aver. Analysis. |
| Nickel ...................... | 4.34% |
| Copper ...................... | .58% |

The ore is mined from an open cut, using one No. 43 Rand steam drill, a small hoist, buckets and derrick. It is loaded direct into wagons and teamed to the mine siding, three-quarters of a mile away on the Porcupine branch of the railway. The open cut is about 60 feet long, 10 feet wide and over 40 feet deep. Further along the ore body has been opened at surface for a distance of 200 feet, the cut being 9 feet wide and 9 feet deep. The total length as exposed, is given as 300 feet, beyond which it is said to be covered by drift. Pyrrhotite, however, is found some 1,200 feet away from the present workings, seemingly on the strike of the ore body being mined.

With a somewhat improvised plant—large enough for current purposes, unprepared for more than it is called upon to perform, it is complimentary to the owners that they modestly capitalize their company at $40,000 in dollar shares, issued $30,000, and have reserved $10,000 in the treasury. No stock has been sold. It is all held by the original partners who staked the property—which is a new departure. On the other hand there have been overtures looking to the purchase of the property, contingent on the demonstration of more ore than is indicated in the shallow workings and at outcrop.

A profit is realized from the shipment of the raw ore to the Mond Company, but the large producing companies of the Sudbury District declined to purchase the Alexo mine. A short time ago the Messrs. Guggenheim were prepared to explore the property and take it over if the tonnage became greater. Several years ago Mr. David Fasken interested the Canadian Copper Company in the matter. Some diamond drilling was done, but results were not deemed sufficient to warrant a deal. The Mond Company also is said to have drilled the property. It may be extensions to the ore bodies will be uncovered. Dr. Coleman, in describing the Alexo situation, says:

> "The ore crops out for about 200 feet, with about 6 feet of solid ore at the widest place, followed by several feet of mixed ore and rock, and finally by serpentine with only a few specks of ore. Below the surface the solid ore thins out and at 100 feet depth there is only mixed ore and rock against the foot-wall."

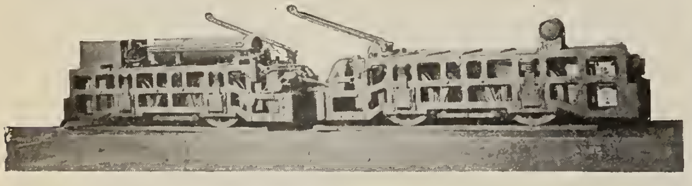
The latter feature doubtless was ascertained by means of the drilling; because the open cut boring is not 100 feet deep.

## ELECTRIC MINE LOCOMOTIVES.

The Carnegie Coal Company has recently installed at the Charleroi Coal Works two of the largest mine locomotives ever built. These locomotives weigh 30 tons apiece and are of the Baldwin-Westinghouse "Barsteel" type. It is estimated that each locomotive can haul 100 cars each loaded with 3 tons of coal over the local grades.

The Carnegie Company recently acquired possession of the Charleroi mine, which is of considerable size and is well developed. A large production is desired from it, but the haul is about two miles long with the grade largely against the load. Hence the average haulage locomotive of from 15 to 25 tons would not be sufficiently large to keep production up to the estimated tonnage.

The locomotives possess a number of interesting features.



A 30-ton mine locomotive

Each locomotive consists of two separate units which can be separated and used as 15-ton locomotives if desired. This use of two units in tandem is advantageous in such large machines because the weight is distributed over 8 wheels instead of 4, and hence the locomotive has great tractive power and is also easier on the track than if the weight were more concentrated.

The "barsteel" construction represents the most modern type of design. As is clearly seen in the illustrations, the frames are not built up of plates, but are formed of a grid of steel bars of heavy cross-section. The side frame of each unit is cast separately forming an extremely strong and rigid construction. The openings in the frame give ready access for inspecting, oiling, replacing brake shoes, adjusting brake rigging, etc., and also provide thorough ventilation to the electrical apparatus so that its all-day efficiency is higher than would be the case if the frame were totally enclosing. This type of frame has been in use for many years for large freight locomotives, but has been only recently adapted for mine locomotives.

Air brakes are used owing to the greater ease of handling so large an engine, but each unit is equipped with hand brakes which can be operated together from

A 15-ton unit on the tipple

the operating stand of the leading unit. An auxiliary reservoir is provided on the trailing unit, the main reservoir and compressor being located on the leading unit. The hand brakes are operative on both units when disconnected for independent operation.

The controller for the tandem is of the individual magnetic blowout type, and handles all four motors at once. When the tandem is split, the four-motor controller handles the two motors of its unit without change in connection while the other unit has its own two-motor controller.

The tandem with train of coal cars

In addition to the two large haulage units the Carnegie Co. has installed at Charleroi ten traction-reel gathering locomotives or "crabs," also of the Baldwin-Westinghouse barsteel type.

## CANADIAN COAL AND COKE CO.

The Canadian Coal and Coke Co., of Montreal, Quebec, has arranged to take over the properties of the Western Coal and Coke Co., the Pacific Pass Coal Fields, the St. Albert Collieries, and the Lethbridge Collieries, all developing coal mines in Alberta. The authorized capital of the Canadian Coal and Coke Co. is $15,000,000, divided into $4,000,000 preferred and $11,000,000 common. Of these amounts about $3,750,000 of preferred and between $9,000,000 and $10,000,000 of common has been issued, the remainder being retained in the company's treasury. The company has authorized an issue of $3,000,000 of bonds, $2,000,000 to be issued shortly; the proceeds will be applied in discharging certain current liabilities incurred by the several other companies above-mentioned in doing their development work, and the balance will be appropriated for completing development and equipment of the properties and for working capital. Negotiations in connection with placing the bonds are in progress.

# BOOK REVIEWS

**MINERAL DEPOSITS—by Waldemar Lindgren, Prof. of Economic Geology, Massachusetts Institute of Technology; Geologist, United States Geological Survey—McGraw Hill Book Company, N.Y.—Price $5.00 net.—For sale by Book Department, Canadian Mining Journal.**

This work is one of the best on the subject that has yet appeared. Dr. Lindgren's experience as geologist for the United States Geological Survey, and as a teacher in one of the leading technical colleges, has given him unusual qualifications for a masterly presentation of the subject. He has long been recognized as a leading authority on ore deposits. His published works win admiration everywhere.

The scheme of the book is to outline the broader principles of the science of ore deposits. The several mining districts are dealt with only in so far as they afford good examples of the type of deposit being described. The classification adopted is a purely genetic one, and in this the book differs markedly from the well-known texts on mineral deposits which are now in use.

In most of the standard texts an attempt is made to discuss mineral deposits without strict adherence, if any, to a genetic scheme of classification. In most texts, metals and non-metals are discussed separately. Several authors classify the deposits according to the chief metal contained.

Dr. Lindgren avoids the customary treatment and classifies the deposits according to origin rather than according to the contents.

A complete treatment of the subject which would include discussions of distribution, occurrence, structure, origin, production, and valuation of deposits, as well as statements of the uses of the materials mined, process of mining and reduction, and criteria for judging the value of the products, is not attempted. The treatment is from a scientific rather than from a utilitarian viewpoint, the object being to give the student a clearer insight into the geologic relationship of the various deposits.

The first chapter is devoted to definitions of terms used, and to a general discussion of the distribution of the elements, composition of the earth's crust, traces of metals in rocks, price of metals, etc.

Chapter I. deals with the deposition of minerals, solution and precipitation, etc.

The next four chapters deal with underground water. The flow, composition, chemical work; and the origin of the water and its dissolved substances are discussed. These chapters give one of the best presentations yet written of this important subject.

Chapters VII. and VIII. are devoted to spring deposits, and the relations of mineral deposits to mineral springs.

Chapter IX. deals with folding and faulting, definition of the terms, classification of faults, etc.

Chapter X. is entitled, "Openings in Rocks." Attention is called to the various ways in which fractures and other openings are made.

The next two chapters deal with the form, structure, and texture of the mineral deposits and ore shoots.

In Chapter XIII., Dr. Lindgren presents his scheme of classification of mineral deposits, and each of the succeeding chapters deals with one of these classes:

Deposits formed by mechanical processes of transportation and concentration (placer deposits, etc.).

Deposits produced by chemical processes of concentration in bodies of surface water by reactions between solutions (limestones, limonite, bog-manganese ore, phosphate beds, etc.).

Deposits formed by evaporation of bodies of surface waters (saline residues, gypsum, nitrates, etc.).

Mineral deposits resulting from processes of rock decay and weathering (residual iron ores, manganese deposits, hydrated silicates of nickel, etc.).

Deposits formed by concentration of substances contained in the surrounding rocks by means of circulating waters (sulphur, asbestos, Lake Superior iron ores, Mansfeld copper-bearing shales, etc.).

Deposits resulting from regional metamorphism.

Deposits of native copper with zeolites in basic lavas (Lake Superior copper deposits, etc.).

Lead and zinc deposits in sedimentary rocks; origin independent of igneous activity (lead and zinc ores of the Mississippi valley).

Metalliferous deposits formed near the surface by ascending thermal waters, and in genetic connection with igneous rocks (quicksilver deposits, gold at Tonopah, Comstock, Cripple Creek, Goldfield, etc.).

Metalliferous deposits formed at intermediate depths by ascending thermal waters, and in genetic connection with intrusive rocks (gold quartz veins, California and Victoria type, Nova Scotia gold, Cobalt silver, etc.).

Veins and replacement deposits formed at high temperature and pressure, and in genetic connection with intrusive rocks (tin-bearing veins, some Ontario quartz veins, gold telluride veins of Western Australia, etc.).

Deposits formed by processes of igneous metamorphism (contact metamorphic deposits, Clifton, Bisbee, Cananea, Bingham, Boundary district, B.C., etc.).

Mineral deposits of the pegmatite dikes (feldspar and quartz, mica, apatite, etc.).

Mineral deposits formed by concentration in molten magmas (diamonds, chromite, magnetites, Sudbury nickel-copper, etc.).

Metamorphosed deposits (Swedish iron ores, etc.).

In Chapter XXIX., Dr. Lindgren discusses the oxidation of metallic ores, the general conditions, the principles, changes at surface, and secondary enrichment.

Chapter XXX. is a short statement of methods of calculation of rock analyses.

While the work from the mode of arrangement of its material leaves something to be desired from the standpoint of the student who desires to obtain information concerning all the types of deposits in which any one metal occurs, the text is undoubtedly by far the best available for those who wish to study the subject of mineral deposits scientifically.

A number of Canadian deposits are briefly mentioned, and it is interesting to note Dr. Lindgren's ideas of their origin, gathered from the literature rather than from personal observation. Naturally it is with the United States deposits that the author is most familiar. He has evidently, however, perused the literature very carefully and has been able to classify a number of the better known Canadian deposits also.

The asbestos deposits of Quebec are classed, following J. A. Dresser, as concentrations from the surrounding rock—a recrystallization of the serpentine proceeding inward from the cracks.

The native silver deposits of the Cobalt district come under the heading — Deposits formed at intermediate depths by ascending thermal waters and in genetic connection with intrusive rocks. In this he agrees in the main with the published writings of W. G. Miller, A. E. Barlow, J. B. Tyrrell, W. A. Parks, R. E. Hore, and others. Attention is called to the probability that there has been ample opportunity for the deposition of secondary silver by descending solntions as the veins have been long within a short distance of the surface. The peculiar fact that the mineral smaltite, which alters very readily in oxidizing waters, is found a few feet from surface practically unchanged is not mentioned by Dr. Lindgren.

The Porcupine gold deposits are considered by the author as formed at high temperature and pressure and in genetic connection with intrusive rocks. While the Porcupine deposits are very briefly mentioned, the text contains very interesting discussion of similar deposits in Calfornia and Victoria, which are supposed by Dr. Lindgren to have been formed at lower temperature.

The Sudbury nickel-copper deposits are considered to have been formed by concentration in molten magmas.

The Granby and adjoining ore bodies at Phoenix, B.C., are described as deposits due to igneous metasomatism not distinctly related to contacts.

The Rossland gold-copper deposits are considered to have been formed at high temperature.

For the Lake Superior native copper deposits and a few other very similar occurrences a special place is given in the scheme of classification. The deposition is thought to have been connected with the cooling processes of the Keweenawan lavas.

The zeolitization is considered as an after effect of volcanism and the native copper is supposed to have the same origin as the zeolites with which it occurs in the lavas. In this chapter there are a couple of errors which may here be pointed out. The section, on page 400, should be titled Calumet, instead of Houghton. The Calumet conglomerate is on page 401 incorrectly called a 'volcanic' conglomerate. R. E. H.

**CYANIDE PRACTICE, 1910-1913—edited by M. W. von Bernewitz—Mining and Scientific Press—Price $3.00—For sale by Book Department, Canadian Mining Journal.**

This is the third of a series of books published by the Mining and Scientific Press on Cyanide Practice. It includes numerous articles on all phases of current cyanide practice based upon experience in all parts of the world. Most of the articles have been published in the columns of the Press, and a few of them in other periodicals.

An attempt is made to present these articles according to the subjects dealt with rather than according to dates of their original publication.

There are several papers on each of the following subjects:

Chemistry of Cyanidation, Crushing, Concentration and Treatment of Concentrates, Roasting, Agitation, Decantation, Filtration, Precipitation and Clean-up, Disposal of Residue, Measurement and Estimation of Tonnages.

There are also a number of descriptions of present practice in several districts, and detailed descriptions of several mills. The names of many prominent metallurgists are included in the list of authors, and the publishers deserve much credit for gathering together so much up to date discussion and description of cyanide practice.

# RECENT STRIKE OF OIL AND GAS IN WESTERN ALBERTA

By R. W. Brock.

The Geological Survey has received a sample of the oil recently struck in No. 1 well of the Calgary Petroleum Products Company, situated at Black Diamond, sixteen miles west of Okotoks, Alta. This oil was struck at a depth of about 1,560 feet. It is what is technically known as a "white oil," being transparent and of an amber colour. It is phenomenally light for a natural mineral oil, having a specific gravity of about 62 Baume. Evidently it consists largely of gasoline. In fact, it has been successfully used in its raw state in place of gasoline in an automobile.

"White oils" are rarely found in quantity. They would appear to be the result of filtration through clay strata, under pressure, of the lighter portions of ordinary petroleum. That this has occurred in the present instance is made probable by the fact that at a higher horizon in this well a flow of gas 2,000,000 feet a day was struck.. This gas is also peculiar in the large amount of gasoline it contains. It probably represents a farther stage in the process of filtration.

The amount of oil present has not yet been determined, so that the commercial value of the strike is still unproved. If the amount of gas encountered in the higher level is any criterion, this may prove to be the exceptional case, and a considerable quantity of oil, for a "white oil," be obtained.

Whether oil is present in large quantities or not, the strike is of importance, as the "white oils" are usually found only in the vicinity of large bodies of the ordinary petroleum. Thus it is an excellent indicator.

Mr. D. B. Dowling, of the Geological Survey, who visited the well shortly before the strike was made, reports that the well is located on an anticline, in shales of the Pierra formation, and that the oil was encountered in underlying Belly river beds. On either side of the anticline overlying Edmonton beds are exposed. Going eastward therefore the covering will rapidly thicken. Westward toward Moose Mountain, according to the work of D. D. Cairnes, of the Survey, the formations are folded into a number of anticlines bringing lower formations to the surface, and in Moose Mountain faults are encountered. Between this faulted ground and the well are several anticlines where prospecting for oil might be undertaken. These anticlines probably run in the direction of the main structural lines, that is, roughly parallel to the mountain ranges. Mr. D. B. Dowling, of the Geological Survey, is now in the field, having been commissioned by the Director to examine the well and make a study of the geology of the district.

# PERSONAL AND GENERAL

Mr. J. G. McMillan has been appointed inspector of mines for the Cobalt district. Mr. McMillan is a graduate of the mining department of Toronto University. Some years ago he was in charge of the Foster and later the Hargraves mines at Cobalt. Mr. McMillan has made numerous explorations in northern Ontario for the Provincial Government and recently returned from Hudson Bay where he was making harbour surveys for the Dominion Government. Mr. McMillan succeeds Mr. T. F. Sutherland, who was appointed successor of Mr. E. T. Corkill.

Mr. Clement Foster is in England. It is understood that his visit is in connection with the flotation of the Tough-Oakes Mining Company.

A number of mining engineers have been recently examining properties in Bartlett township, south of Porcupine.

Mr. H. S. Robinson, engineer of the Trethewey Mining Company, is now at the West Beaver mine, in the Port Arthur district, which is under option to the Trethewey.

Mr. H. Grattan Tyrrell, bridge engineer, of Chicago, gave an illustrated lecture on October 15th, before the Engineering Society of Northwestern University, on the subject of "Bridge Engineering." Mr. Tyrrell, who is a graduate of Toronto University, was formerly chief engineer for one of the Ohio bridge companies, and afterwards special engineer of bridges for the Harriman railroads in the Western and Pacific States. He is author of several books on bridge and structural engineering.

At the Buffalo mine, Mr. J. M. Swent has been appointed engineer, and Mr. C. Beech assistant engineer.

Mr. J. H. Plummer is in London.

Mr. W. H. Aldridge, of New York, formerly managing director of the Consolidated Mining and Smelting Company of Canada, Ltd., now managing director of the Inspiration Consolidated Copper Company, has been elected a member of the Executive of the American Mine Safety Association, which held its annual session at Pittsburg, Pennsylvania, at the end of September.

Mr. A. W. Allen, of Victoria, B.C., has been in Winnipeg, Manitoba, conferring with the directors of the Lucky Jim Zinc Mines, Ltd., as to resumption of operations at the company's Lucky Jim mine, in Slocan district, B.C. Since the death of the managing director, the late Mr. Thos. G. Procter, Mr. Allen has been in charge of the company's affairs in British Columbia.

Mr. A. J. Beaudette has gone to New York to report to his principals the result of the 1913 season's prospecting work on a coal property situated in Dockrill's basin, southeast of Hazelton, Omineca mining division, B.C.

Mr. Wm. Blakemore, of Victoria, B.C., has been in the Flathead country, Southeast Kootenay, examining coal and oil lands.

Mr. R. W. Brock, director of the Geological Survey, after his return from Yukon Territory, was leader of a party of International Geological Congress excursionists who visited Rossland on their way back East. Before returning to Ottawa, Mr. Brock spent a week or so in British Columbia on Survey business.

Mr. Chas. Camsell recently gave an address in Vancouver, B.C., illustrated by lantern slides, under the auspices of the Vancouver Chamber of Mines, on the mineral resources of the western part of the Northwest Territories of Canada. He also gave information relative to parts of Similkameen district, B.C.

Mr. Paul S. Couldrey, formerly manager for the Le Roi No. 2, Ltd., at Rossland, B.C., but now superintendent of the Cerro de Pasco Co.'s copper mines in Peru, has been spending a holiday in the south of France.

Mr. R. G. Drinnan, for years superintendent of coal mines in the Crowsnest district, B.C., now in charge of coal properties in Alberta, is making Edmonton his headquarters instead of Vancouver, B.C.

Mr. Chas. Fergie and Mr. J. M. Gordon, of Montreal, were recently at coal mines in Alberta, of which the former is the managing engineer.

Mr. R. P. Featherstonhaugh, well-known in connection with placer-gold mining operations in Atlin district, B.C., lately returned to the Omineca Gold Mines Co.'s placer mining work on Quartz creek, in Omineca mining division.

Mr. Thos. Graham, chief inspector of mines for British Columbia, when on an official visit to the Crowsnest district last month, took advantage of the opportunity to see some of the coal mines about Lethbridge, Alta.

Mr. W. D. Greenough, manager of the Atlas Mining Co.'s mines in Whitehorse copper camp, Southern Yukon, left that camp last month for a trip to see his principals in the United States.

Mr. F. T. Hamshaw, of New York, formerly managing a placer-gold mine on McKee creek, Atlin, B.C., after having obtained an option on several of the working claims in Shushanna gold field, Alaska, left that field last month for "the outside," to make arrangements for operating them next mining season.

Mr. H. L. Hollis, of Chicago, Illinois, recently examined the Surprise silver-lead mine, in Slocan district, B.C.

Mr. Henry Kehoe, of Spokane, Washington, who spent several months of last year in Ontario, has been appointed engineer in charge of mining operations of the recently organized London-Arizona Consolidated Copper Co., in Pinal county, Arizona.

Mr. Jas. McEvoy last month examined a coal mining property situated about 12 miles from Princeton, Similkameen, B.C.

Mr. John McMartin has been in British Columbia, both in the country most conveniently reached from Prince Rupert, the Grand Trunk Pacific Co.'s western terminus, and at Sheep creek Nelson mining division.

Mr. O. B. Perry, manager of the Yukon Gold Co., arrived at Skagway from Dawson early in October on his way south.

Mr. Royal Pullen has been appointed assistant superintendent of the operations of the Canadian-Klondike Mining Co.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, is making investigations in connection with placer-gold mining about Barkerville, Cariboo district.

Mr. F. M. Sylvester, for several years assistant to Mr. Jay P. Graves, general manager for the Granby Consolidated M. S. and P. Co., has been appointed general manager on Mr. Graves' retirement owing to ill-health. Mr. Graves remains on the directorate of the company as vice-president.

Mr. Francis A. Thomson, head of the mining engineering department of the State College of Washington, Pullman, Washington, has been appointed acting dean of the faculty of the college. Professor Thomson is well known in the more productive metal mining camps of southern British Columbia, with operations in some of which he has been associated.

The Canadian Westinghouse Co., Hamilton, has issued a bulletin describing carbon circuit breakers.

The McKiernan-Terry Drill Co. has issued a bulletin describing 'Wizard' rock drills.

The H. W. Johns-Manville Co. has secured the contract to furnish 67,500 square ft. of J-M built-up asbestos roofing to cover the new railway exchange at St. Louis.

This firm's product is built up on the roof from successive layers of asbestos (rock) felts, cemented together and coated with Trinidad lake asphalt.

The Siemens Company, of Canada, has received an order from the Dome Mines Company, Ltd., of South Porcupine, Ont., for 1 450-h.p., 250 r.p.m. 550 volt, 50 cycle slip-ring type induction motor, and short circuiting and brush lifting device, pedestal bearings, together with a Siemens type liquid starter. The motor is for driving a compressor made by Belliss & Morcom.

One of the contracts in connection with the construction of the new Michigan Central Terminal at Detroit is for 200,000 square feet of J.-M. Built-Up Asbestos Roofing, involving five carloads of material, to be used for railroad sheds alone. If placed end to end these sheds would extent over a mile. The contract for this roofing was given to the Detroit branch of the H. W. Johns-Manville Co., the well-known manufacturers of asbestos products, who are also furnishing the waterproofing, J.-M. Vitribestos Smoke Stacks Lining, two thousand feet of J.-M. Sectional Conduit, and 16,000 linear feet of J.-M. Asbestocel Pipe Covering for plumbing, heating and power lines throughout the building.

# SPECIAL CORRESPONDENCE

## YUKON TERRITORY

A Norwegian named J. Nielson, who, after conviction on a charge of having attempted to blow up one of the gold dredges of the Guggenheim Co., out of spite for having been discharged from employment, was sentenced to 20 years' imprisonment, is now in the penitentiary at Kingston, Ontario. He was taken down from Dawson by two of the Northwest Mounted Police; the journey occupied 15 days, close steamer and train connections having first been arranged for. He is thought to be a little off his head.

After having spent 14 years in Yukon Territory, Mr. G. W. McLean recently retired from the important position of Comptroller and left Dawson for Ottawa. When in Vancouver, B.C., en route, Mr. McLean stated, as reported in a local newspaper, that efforts were being made to extend the Yukon mining season this autumn. New machinery and gold dredges were being taken north. The output of gold, which was nearly $5,550,000 in 1912, will exceed $5,000,000 this year. It is expected that gold will be found in the Canadian Yukon, across the International boundary line from the Chisana field in Alaska.

**Wilson Creek.**—Capt. O. J. Newcomb, master of the packet St. Michael, which arrived at Dawson from the mouth of the Yukon river on October 8, brought news of a gold strike having been made on a stream running into Palta slough, one of the most travelled channels on the Yukon, about 200 miles from St. Michael and 50 miles below the Russian mission. The scene of the strike is a stream 18 miles long, called Wilson creek. The tundra is 7 to 8 ft. deep, similar to that of the Nome country. Captain Newcomb stated that men were taking out $30 a day to the rocker, and he had seen several with small pokes of gold. The strike was made four or five weeks ago, and when his steamer passed up the slough about September 20, 50 men had already staked claims. The same men had also staked on smaller streams, called Disappointment and Independence, in the vicinity. The Northern Commercial Co. has stocked one of its barges with supplies and placed it on Wilson creek as a floating store.

**Lone Star.**—Mr. T. A. Firth, secretary of the Lone Star Quartz Mining Co., is reported in newspapers to be shipping to San Francisco one ton of high-grade gold ore from the company's property, situated near the head of Victoria gulch, a tributary of Bonanza creek. The ore has been insured for $2,000; in it are specimens estimated to run at a rate of more than $10,000 to the ton. It is expected the returns from the shipment will be between $4,000 and $5,000. The company owns eight claims and shareholders in the company are chiefly Dawson men. Dr. D. D. Cairnes included in the information he prepared for the International Geological Congress excursionists, who visited the Yukon in September, the following brief notes: "On the Lone Star group several hundred feet of work has been done in open-cuts, trenches, shafts, and tunnels. A Joshua Hendy 4-stamp mill has been erected on the property, and a gravity tramway 3,500 ft. long has been constructed to convey the ore from the mine-workings to the mill on the creek 900 ft. below. In addition, a power line four miles long has been built to transmit current to the mill from the power line of the Northern Power and Light Co. on Bonanza creek. The total gold production from this property has so far been small; not nearly enough to pay for the development work. All the quartz properties in the district, however promising their character, have still to be considered as being in the uncertain prospect stage." (Note.—It must be remembered that Dr. Cairnes wrote some time ago, probably before the work of the 1913 season was done.)

**Shushanna.**—Mr. O. B. Dickeson, president of the White Pass and Yukon Route, which has a railway from Skagway to Whitehorse, 110 miles, and thence steamers for the season of navigation and stages for winter—461 miles to Dawson, on his return from the Yukon said: Our mining engineer this year examined the White River district, which we believe has a bright future. The gold strike in the Chisana country, just beyond the White River copper region, is bound to assist considerably in providing transportation business for a railway if we extend our system into the White River district. With reference to the Chisana district to date our company has refrained from saying anything regarding the value of the gold finds there, but the best evidence of what we think is, however, the fact that we have spent more than $150,000 in buying horses, supplies, etc., with the object of providing for the needs of that camp, and this will not come anywhere near supplying the requirements of those going into that country. We know for a certainty that in one place, 250 by 16 ft., $27,000 in gold was taken out in six weeks, and that is not the only place at which gold has been discovered, different discoveries being some distance apart. Practically all of the prospectors who went in by our route came out for supplies and are returning to the field, which is the best evidence of what they think of it. There are three distinct routes: First, the Whitehorse-Kluane trail, which is the shortest in point of distance from Seattle or Vancouver; second, the White River route, from the mouth of the White river to Donjek; third, the Coffee Creek trail. The two first-mentioned are stated by men who have gone in and out to be the best. Up the White river to Donjek will be the most economical and best summer route for many reasons. We sent a light-draft steamer two trips up White river and landed passengers and goods at Donjek, the nearest point of organized transportation to the diggings, about 80 miles. We have sufficient faith in the country to immediately extend our operations to take in passengers and supplies whenever the conditions warrant our doing so.

A suit in equity, filed in the Yukon Territorial Court by Henry Dubois and Hugh Brady, hotelkeepers, Dawson, against William James, discoverer of the new gold field named Shushanna, in Chisana River district, Alaska, M. Wales, who accompanied James, and William Johnson, for an injunction restraining the defendants from selling the Shushanna claims and disposing of the gold obtained therefrom, they having grubstaked James and Wales. The suit has been settled out of court. The claimants state that they are to receive a substantial interest in some of the claims staked by the defendants, who have bonded the Shushanna property to F. T. Hamshaw, of New York, it is said, for $500,000.

**Close of Navigation.**—Navigation on Yukon river was nearing its close for the season toward the middle of October. Ice had already formed in many places along the river prior to October 10, and some of the larger steamers were being prepared for their winter quarters. Mails will be taken to river points in launches until the freeze-up. Down the river the water in tributaries was so low that boats had difficulty in navigating them, consequently some of the camps nearly missed getting in their winter's supplies, but rain fell and relieved the situation.

### ALBERTA.

A discovery of placer gold on the Macleod river, west of Edmonton, has been reported by John Gentle, an old prospector, who showed some nuggets, one of which was stated to weigh a little more than two ounces. Several men, well-known in Edmonton, have been taken by Gentle to the scene of his discovery to stake claims. Meanwhile no confirmation of the report has been received.

Coal mining news items, from the District Ledger, Fernie, follow: The mines at Pocahontas, about 200 miles west of Edmonton, worked only part time lately; miners are quitting the camp owing to the dull times prevailing. Many students are attending Mr. Tom Stephenson's classes in mining, which are being held weekly at Bellevue, in the Blairmore-Frank district. Men responsible for guiding the destinies of the Western Coal and Coke Co. recently visited the company's Beaver mines, west of Pincher creek. They were led by Messrs. Chas. Fergie and J. M. Gordon, of Montreal. It is stated that operations on a large scale will be commenced next spring; meanwhile, No. 2 mine is to be worked as at present, producing 200 tons of coal a day, but in order to keep it working expenses are to be cut to a minimum for the time being. At Coalhurst, the mine is being worked steadily, with plenty of railway cars always on hand and plenty of labour power for production. The mine-rescue men are hard at work training—one team in the morning and one at night. Three times a week they tackle the smoke chamber, testing their own endurance and the abilities of their oxygen helmets. A big blaze at Galt No. 3 mine, Lethbridge, caused much excitement one evening lately, many thinking the tipple was on fire. Fortunately, it was found to be less serious—a stack of mine timber was burning, and the fire was at the end farthest away from the bankhead. Both No. 1 and No. 2 fire teams were quickly there, and they worked hard all night keeping water continuously playing on the burning and surrounding timbers. By daybreak all danger of the fire spreading was over, but all the following day men were working at the smouldering timber. It is estimated that ten carloads, about 30,000 props, were destroyed and that the loss is about $5,000.

Work has been commenced on the Keystone Cement Co.'s property just west of Frank. Men are busily employed clearing the ground and preparing for building.

In an address recently given before the local Chamber of Mines, at Vancouver, B.C., Mr. Chas. Camsell, of the Geological Survey of Canada, predicted a great future for the country from Athabasca, in Alberta, right through the Mackenzie river district to the Arctic ocean. Oil and tar exude from the ground in many places, and having in mind the present value of oil the country has great commercial possibilities.

In connection with the foregoing, attention is drawn to Memoir 29-E, "Oil and Gas Prospects of the Northwest Provinces of Canada," recently published by the Geological Survey of Canada.

There has been much excitement at Calgary, following the reported striking of oil in what is known as the Dingman well, in Okotoks district, south of and about 30 miles from, Calgary. Local newspapers state that Mr. A. W. Dingman, manager for the Calgary Petroleum Products Co., has admitted that the strike is of more importance than was at first given out, and that oil of good quality is present in commercial quantity. There are many applicants to the Dominion land office, Calgary, for leaseholds in the vicinity of the Dingman holdings. Several other wells are being drilled in the district.

## NOVA SCOTIA

### THE NOVA SCOTIA MINING SOCIETY.

The headquarters of the Nova Scotia Mining Society has been removed from Halifax to Sydney. Rooms have been rented in the centre of the business section of the town, and the library of the society will be suitably housed. The local secretary is Mr. E. C. Hanrahan. The editing of the transactions will be still in the hands of Mr. Harry Piers, the Provincial Librarian, and the society will continue to be represented in Halifax by Mr. Saunders. The removal of the society to Cape Breton is significant of the remarkable change in the industrial life of Nova Scotia that recent years have brought about. Coal is overwhelmingly the mineral staple of the province to-day. Gold mining has declined to small proportions, iron ore mining has entirely ceased; in fact, metal mining at the present time in Nova Scotia is negligible, and the mineral industry is confined almost altogether to non-metallic minerals, namely, coal, gypsum, and limestone, building stone and brick-clays. The great bulk of these minerals is being mined in Cape Breton Island. The percentage of coal mined in Cape Breton is steadily increasing, and it is, moreover, the only part of the province where larger coal outputs may be expected in the future than have been obtained in the past. It is, therefore, beyond question that the capital town of Cape Breton should be the headquarters of the long established Nova Scotia Mining Society, with its honourable traditions, which Sydney may be relied upon to preserve and possibly to add to, as its citizens, and the mining fraternity in particular, appreciate the compliment implied in the change.

**Need of Technical School.**—The next thing that Cape Breton needs is a technical school, properly housed and with adequate equipment, and there can be little doubt that this provision will soon be forthcoming. It would be difficult to find anywhere else a concentrated industry so large and important as the coal mines and steel works of Cape Breton with so little opportunity offered to the workers to improve their intellectual grasp and their technical knowledge. In making this statement there is no intention to disparage the present schools. On the contrary, indeed, for every praise is due to those who are now endeavouring to carry on the evening technical classes under difficult conditions and with miserably inadequate appliances. The amount of money sent out of Nova Scotia as payment for correspondence courses in technical subjects is very large, and there can be but little doubt that the money sent from Cape Breton during the past twenty years for correspondence tuition would have gone a long way towards providing proper facilities at home. It must, of course, be admitted that the industrial development of Cape Breton has been very rapid and it has been difficult to provide all the requirements of an urban industrial population as quickly as the need has become apparent. The great expansion of the steel-coal industry dates back but a little over ten years, and things have not always looked rosy during that time. The bustling town of New Waterford, the most recent addition to the incorporated towns of the Province, was but quiet farms and forest less than five years ago, although to-day the municipality contains four large collieries and has a population of approximately five thousand persons. From now on it is not likely that the increase in tonnages and population will be so spectacular, but it may be safely assumed that there will be no looking back and that the industries of Cape Breton have attained a permanence that justifies the ambitious and thoughtful portion of the community in looking forward to the provision of educational facilities similar to those already in existence in similar communities in other parts of the world. We can assure the members of the Royal Commission on Technical Education that there is no part of the Dominion where the governmental aid suggested by the Commission could be more usefully applied than in Cape Breton.

## BRITISH COLUMBIA

The approach of winter has been made evident by light falls of snow in some of the mining districts where the elevation is comparatively high. No interruption of operations has yet been reported, though, except that in placer-mining camps the season is near its close.

Lode mining is maintaining its customary rate of production, as a rule. The larger producers—Granby Consolidated, British Columbia Copper, Consolidated Mining and Smelting, Britannia, Hedley, and several companies mining silver-lead or lead ores—Standard, Sullivan, owners of the Bluebell, and others—are together keeping the ore-tonnage figures well up to the level of other years.

Some progress has been made toward increasing the production of coal from Vancouver Island mines, the Western Fuel Co. having made a beginning from its No. 1 mine at Nanaimo, while the Pacific Coast Coal Co. at its Fiddick colliery, and the Canadian Collieries at its Extension mines, are also working in the direction of resuming production to some extent. The Jingle Pot, near Nanaimo, and in very much larger degree the Canadian Collieries at the Cumberland mines, are working to practically full capacity.

### SLOCAN.

**Sandon.**—More ore has been found in the Slocan Star mine. About October 8 the crosscut which is No. 8 level from the main rise from the deep-level drift to the old workings, broke into ore, and where it entered the veins there was between two and three feet of clean shipping silver-lead ore. About two years ago the Slocan Star Mines, Ltd., was organized to acquire and operate the Slocan Star and Rabbit Paw groups of mineral claims which had been the subject of extra-lateral rights litigation between the Star Mining and Milling Co. and the Byron N. White Co. during a period of about ten years. The matters in dispute were finally determined by a judgment of the Supreme Court of Canada in 1909. Afterward a merger was arranged and the present operating company incorporated. Following the recommendations of Mr. A. G. Larson, of Vancouver, the new company drove a crosscut adit more than 2,000 to the Slocan Star vein, which was drifted on for some distance without any considerable quantity of shipping ore being met with. Eventually a raise was made to the old workings, No. 5 level, the lowest opened out to the surface by the old company, was 300 ft. vertically above the new low-level drift, and twice that distance on the average dip of the vein down to No. 5. The vein and ore-shoots, however, had been followed to a vertical depth of 132 ft. below No. 5. After making the necessary through connection, the work of driving a series of crosscuts from the raise to the ore-shoot, the direction of which had been ascertained, was undertaken. That first above mentioned is one of these, the ore-shoot having been reached previously at a level between the old workings and what is now No. 8. While no information has yet been received on this point, it is probable that No. 8 is about halfway between the old workings and the deep level below—say 300 ft. on the incline—deeper than No. 5. Whatever its precise depth, the fact remains that ore of shipping grade has been found at greater depth than the old workings, which is a decidedly important and encouraging development.

### BOUNDARY.

**Grand Forks.**—Granby Consolidated Co.'s report for September shows a total of 103,830 tons of ore treated at the company's smelting works here; of that quantity, 102,310 tons, was from the company's mines at Phoenix, and 1,520 tons custom ore. Blister copper shipments totalled 1,855,490 lbs., while the refined copper produced was 1,824,659 lbs.

**Greenwood.**—The Jewel-Denero Mines, Ltd., is employing 35 men; more will be put on as soon as accommodation for housing them shall be completed. The company's 15-stamp mill is being regularly operated, difficulties that occasioned frequent stoppages previously having been overcome by the present general manager, Mr. Chas. A. Banks. Finer grinding in a tube mill has admitted of a change from the earlier custom of shipping concentrate being abandoned and the gold being recovered in the mill.

### SIMILKAMEEN.

**Hedley.**—The Gazette included among its recent mining news of Camp Hedley some items of which the following is a summary:

Mr. C. H. Poirier, mining engineer, has been sent in to examine the Golden Zone mine. After looking over the ground he decided to have the workings pumped out so that he could make an examination underground. The mine is being unwatered for the purpose.

The Minister of Lands has given his decision in the Similkameen River water rights case in which the Hedley Gold Mining Co. had appealed for recognition of its claims. The company is given the lower record on the river under certain conditions and the holders of the prior right are to have for their intake and headworks a site higher up the river. Certain costs in connection with the survey of sites by the latter are to be borne by the company, which will then be free to proceed with its water power project should it accept the conditions imposed. More power is required by the company to allow of a proposed considerable enlargement of its stamp-milling operations being carried out.

The Hedley Gold Mining Co., in line with its past policy of paying its employees a higher rate of wages on a graduating scale when the price of copper goes up (as is done by some of the copper-producing companies operating in the province) notwithstanding that it does not benefit a cent from a higher price for copper, since it produces only gold, has notified its men that their pay has been increased 25 cents a day as from August 31. A number of men in the company's employ, apart from this general advance, for special capability in their work, are paid at a higher rate than the regular scale for similar work in other camps.

### YALE.

**Hope.**—Work has been suspended in the tunnel of the Aufeas mine pending the construction of an aerial tramway and ore bins. The mouth of the tunnel is on a steep hillside with no place there for storing ore. The face of the drift is in solid ore, so arrangements are being made to facilitate its transportation.

At the Araucumo, enough work having been done to show the existence of a good body of ore, a roadway is being cleared a distance of 3,000 ft. to the Cariboo wagon road.

Negotiations in connection with the project to install a stamp-mill on Hidden creek, delayed by the death of the late Mr. H. R. Bellamy, who previously had them in hand, have been resumed.

**Kamloops.**—More machinery is to be installed at the Iron Mask mine from which shipment of ore to the smelting works at Trail has been made lately. W. Clay has arrived from the Eastern United States to put in the additional plant which is expected to reach the mine shortly.

Prospects in the vicinity of Lake LeBois show promising looking deposits of ore containing lead carbonates. The ore has been exposed for more than 100 ft.

The erection of a small stamp mill has been completed up the North Thompson river, and preparations are being made to commence crushing a lot of ore from various claims in the vicinity.

Mr. W. M. Brewer has been looking over the Cotton Belt group of claims in Seymour Arm camp, to prepare a report on them for the Provincial Bureau of Mines.

### SKEENA.

**New Hazelton.**—Harris Bros. have completed the work of driving on the 100-ft. level of their American Boy silver-lead mine on Nine-Mile mountain. They are now preparing to sink their No. 3 shaft 100 ft. deeper.

Camp has been removed to below timber line on the Highland Boy group on Rocher Deboule mountain and preparations are being made for the winter's work, which is to include driving an adit about 1,000 ft. to crosscut four veins, one at a depth of 1,500 ft. below its outcrop.

Mr. R. P. Trimble, who recently purchased the Great Ohio group of eight claims on Rocher Deboule mountain, has let a contract for the erection of bunk and boarding houses, blacksmith shop, office, etc.; construction of a trail, and running a drift 300 ft. on No. 1 vein. The contractor has commenced the work.

At the Silver Standard, on Glen mountain, from which ten cars of silver-lead ore that averaged $106.42 a ton was shipped to Trail, the drive to the north of the 250-ft. level has entered what is believed to be the same shoot of ore as occurs on the 100-ft. level. Some extra good ore has been found in a drift on the upper vein. Nearly all the men are now employed in taking out ore, to have it in readiness for shipment as soon as the snow shall be deep enough to allow of its being taken to the railway.

### OMINECA.

**Hazelton.**—Manson is the centre of the Omineca River placer gold field. Official statistics for the current year are not yet available, but for 1912 they showed that 38 new placer leases had been taken up and many transfers of old leases made, the tendency being for consolidation of leases in financially strong hands, owing to the existing necessity for putting in heavy plant and machinery to work to advantage.

The Omineca Gold Mines has completed its 1913 season's work and the superintendent, Mr. R. D. Featherstonhaugh, has left Quartz creek for Vancouver. Mr. F. E. Groffman, also with this company, when on his way to Hazelton lately met on the trail 120 pack animals, most of which were carrying supplies for companies operating at Manson or on Omineca river. Prospecting work during the season just closed has generally resulted satisfactorily.

### GENERAL NOTES.

A ditch line has been surveyed for the Summit Creek Hydraulic Mining Co., Ltd., in Cariboo mining division. The company intends shortly to commence construction of the ditch, so as to be in shape for gravel-washing operations in the first part of next season.

A miner who in July, 1912, was so injured that as a result he has since suffered from partial paralysis of the lower limbs, has succeeded in obtaining a Supreme Court judgment for $5,000 against the Little Billy Mining Co., which has been operating the Little Billy mine near Van Anda, Texada island.

The British Columbia Copper Co. is continuing the development of the Eureka, situated within a dozen miles of Nelson. Recently there was developed ore of higher grade than any previously mined; beside its copper content silver shows freely in it. The company is also working the Queen Victoria copper mine, situated about eight miles below Nelson and on the opposite side of Kootenay river.

## COBALT, GOWGANDA, ELK LAKE AND SOUTH LORRAIN

**Millerett**—Surface development on the Millerett, which is now the property of the Miller Lake-O'Brien at Gowganda, is most encouraging. Trenching under the direction of an old prospector this summer has revealed the presence of a series of veins and cross veins on the Millerett, close to the contact between the Keewatin formation and the diabase, although entirely in the diabase. Silver is found in the smaltite veins, and as leaf in the wall rock over an area of several feet. The ore on the surface is patchy, sometimes two to three inches wide, sometimes a mere crack with cobalt bloom; but in comparison with the surface showing made by the system of veins being worked on the Millerett now, they are rich. Several promising leads have also been found on the Miller Lake-O'Brien. It is a matter of interest if not of economic importance to note that very high gold assays have been made from the ore taken from these new finds. Ore which showed little or no free gold ran as high as 37 ounces to the ton. To develop these new ore bodies a shaft will be sunk and vigorous development commenced at once. In view of local conditions the management attach great importance to the new discoveries.

**Miller Lake-O'Brien.**—Underground on the Miller Lake-O'Brien a 90-foot ore shoot has been developed on one of the cross veins at the 300-foot level. This is all high grade ore. Last month (September) the Miller Lake-O'Brien made a record production with a total of 70,000 ounces. August was almost as good with 65,000 ounces, and it can be said that the property owned by Mr. M. J. O'Brien has never been in better shape. There have been six cars shipped this year averaging about 40,000 ounces a car. Nothing but high grade ore and concentrates is shipped. The Millerett mill has been treating about 30 tons a day since it was taken over, the rock being transported from the shaft at the Miller Lake-O'Brien to the mill in an auto truck. Owing to the high cost of fuel the mill has been shut down until the hydro-electric plant which the company is building is ready. When it is operated again the ore will be taken over on a tramway which is now being built.

**New Power Plant.**—To continue to operate the Miller Lake-O'Brien had to find some solution of the power question. Wood has now to be transported a distance of three miles, and it cost the company a minimum of four dollars a cord. Encouraged to look for a long life by reason of the new discoveries and the improvement underground the company is now expending a considerable sum of money in installing a power plant between Gowganda and Burt lakes. The first unit of the plant will give the company 300 horse power. Two sets of water wheels will be installed and one generator and a pole line two and a half miles long built to the mine. It is estimated that the power will constitute a saving over wood fuel of from $15,000 to $20,000 a year.

**The Mann** on the west ridge at Gowganda, is meeting with considerable success in its development of the Boyd-Gordon which was purchased some time ago. The ninety foot shoot of high grade ore being developed on the 120-foot level is largely in Boyd-Gordon territory. The Mann has a carload of very rich ore on hand but it is not likely that it will be shipped until January when the winter roads will make transportation easier and more inexpensive. On two veins an aggregate of about 130 feet of good ore has been developed at the 120-foot level. During the year the Mann has been examined by several English syndicates and it was under option for some time. It has not yet changed hands.

General conditions in Gowganda have not much improved. The lack of money for speculative purposes has hindered development in the Montreal River district probably more than anywhere else. While camps with fair prospects can be reached by rail in Northern Ontario, syndicates fight shy of investing in a section where transportation expenses are necessarily higher.

The Gowganda road is much better than it has been previously, but it is still a day's journey from Elk lake in the summer months, and the freighting of supplies is an expensive matter. The government has done a little work on the road this summer in improving bad places and the Miller Lake-O'Brien is doing much to make the stretch of road between the mine and Gowganda quite good. But there is a great deal of work to be done on the road yet before it can be said that it is not the worst in Northern Ontario between two such important points as Elk Lake and Gowganda.

**Beaver.**—It is probable that the Beaver Consolidated will resume dividends before the end of the year. The directorate has decided that the shaft shall be put down with all expedition to the 1,000-ft. level. A level has already been established at the 800-ft. level, but the vein has not yet been cut. Another level will soon be opened up at the 900-ft. On the 460-ft. level some new ore has been found in the wall of the main drift and a new vein has been found at the 700-ft. level.

**Nipissing.**—During the month of September the Nipissing Mining Company mined ore of an estimated net value of $191,753, and shipped bullion from company and customs ore of an estimated net value of $442,588. The ore produced was all from the mine's own workings, but a good deal of bullion was produced from customs ore. The high grade mill treated 156 tons, and shipped 728,204 ounces. The low grade mill treated 6,879 tons.

The most significant development during the month was the announcement as to the policy to be pursued at shaft 64. Cross-cutting at the 650-foot level the main vein was found to be six inches wide, but assaying low in silver. It has been decided to continue the exploratory work in the Keewatin formation, and the main shaft will be sunk to the 900-foot level, and the vein sought at that depth. This is the most important development work the Nipissing has undertaken, and it will go far to solve the question of whether the Keewatin under the Cobalt conglomerate is of any value as an ore-bearing formation.

**McKinley-Darragh-Savage**—The production of the McKinley-Darragh-Savage mines for the month of September was 242,266 ounces, an increase of 30,000 ounces over the production of the preceding month and the highest for the year. The rich ore shoot developed on the 150-ft. level of No. 40 vein is responsible for the higher production, as this ore body gave alone 100,000 of the month's total. The McKinley-Darragh contributed 192,706 and the Savage 49,560 ounces. Of the total from the McKinley no less than 73,000 ounces was of high grade ore sorted and bagged underground.

**Casey-Cobalt**—The new line from the Northern Ontario Light and Power to the Casey-Cobalt has been completed and the mill is now dropping thirty stamps. This gives a capacity of 90 tons daily. The mill had previously but ten stamps, so that the production from the mine will take a considerable jump.

**Trethewey.**—The estimated production of the Trethewey Silver Cobalt mine for the month of September was 56,400 ounces of silver, as compared with 55,000 ounces for the preceding month. During the last two months the Trethewey has been in better shape than for some time previously. In September the mill treated 2,900 tons of ore with the heads running 24 ounces to the ton. The extraction was 82 per cent. as compared with 80 per cent.

**Wettlaufer.**—Owing to the fact that there has been a cave-in of rock at the lower levels of the Wettlaufer mine, the property will be abandoned earlier than was at first anticipated. The South Lorrain property is practically closed down now.

**Water Power.**—Owing to the low water level attained on the Montreal River consequent on the dryness of the summer and fall and the great increase in the demand for power there has been a shortage of power for the mills. Before the rains came in the past two or three days all the eighteen mills of the camp have had to close down in rotation for 24 hours, and there will consequently be a reduction in output of considerable dimensions. It is hoped that the rains will put an end to the shortage. The two plants of the Northern Canada Power Company have a capacity of 12,000 horsepower, but they are overloaded. When the power plant at Fountain Falls is completed it will give an additional 4,000 horsepower, but no service is expected from this quarter this year.

**Difficulty in Selling Ore.**—There is still a very considerable difficulty experienced in selling ore, but competition has been invited from outside and firms not previously interested will probably be customers of the Cobalt mines. It is also hoped to enter the European market.

**Express rates** on silver bullion from Cobalt to England which were raised from $4.50 per hundred pounds to $7.00, have been reduced to $6.00. The Nipissing is shipping to New York, but the remainder of the companies still seek the London market.

**Hollinger.**—Mr. P. A. Robbins, the general manager of the Hollinger gold mines, announces that the gross profits for the four weeks ending Oct. 8th amounted to $145,866, the mill ran 94 per cent. of the possible running time, treating a total of 12,264 tons, of which 311 tons were treated for the Acme Gold Mines, Limited. The average value of the ore treated was $17.80, the approximate extraction 96.40 per cent., and the milling cost $1.376. Mr. Robbins points out that the working cost at $5.18 per ton, is the lowest point yet reached. Development work upon the main vein upon the lowest level is demonstrating that values are about the same as upon the upper levels. Practically one-half the ore milled came from development. In cross-cutting upon the 100-foot level an ore body was found with the same characteristics and high value as No. 1 vein. On the 300-foot level an extension of No. 8 vein has been picked up.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**The Dome Mines, Limited,** has adopted a policy of publishing monthly production records. For September the record reads tonnage milled 10,790, value of gold produced $70,135, mill running time percentage of total monthly hours, 95 per cent. These figures compare with those given out earlier as follows:

| | Tons Milled. | Value. |
|---|---|---|
| April | 9,863 | $129,333 |
| May | 10,852 | 148,499 |
| June | 11,300 | 98,215 |
| July | 11,150 | 75,958 |
| August | 12,720 | 67,660 |
| September | 10,790 | 70,135 |
| | 64,675 | $529,802 |

**Three Nations.**—One hundred and fifty shareholders of the Three Nations Mining Company visited the property at Porcupine this month in a special train. The new ten stamp mill which has been in operation for the past four weeks was visited and while there the first run was made. The entire party was taken underground and shown the veins at the 100 and 200-foot levels.

## THE CALGARY OIL STRIKE.

After a meeting of the Board of Trade and city officials recently, when the matter of the exploitation of the recent oil discoveries was discussed, the following warning was issued to the press and the public:

"To whom it may concern: Attention having been directed from many parts of the world to the reported discovery of crude petroleum in the vicinity of Calgary, it seems expedient that some announcement should be made on the subject with the purpose of preventing false or harmful statement or statements being circulated with respect to the result of the oil-boring operations in this territory.

"After several months of boring, crude petroleum of a limited quantity was struck on October 7, at a depth of 1,562 feet, in the boring upon the property of the Calgary Petroleum Products Company, Limited, located in Section 6, Township 20, Range 2, west of the fifth meridian.

"It is impossible to state whether the oil found merely came from a seepage or indicates the existence of a larger deposit at a greater or lesser distance of depth. Meanwhile boring continues, with some promise of ultimate success, but until oil has been struck in volume, the public is warned against placing too great confidence in circulated reports, and particularly urged to exercise care in investments in oil leases, or in the stocks of companies or syndicates which have been or may be formed for oil exploitations."

The warning was signed by Mayor Sinnott for the city and J. A. Campbell for the Board of Trade.

## PROBLEMS OF OUR STEEL INDUSTRY.

Mr. J. H. Plummer, president of the Dominion Steel Corporation, is due to arrive in London, England, this week-end. When he visited Montreal last week en route to New York, it was not generally known that he had begun his mission which will have direct bearing on the new financing arrangements on which it is believed that the Dominion Steel Corporation must now embark.

It is understood that the corporation will make a satisfactory showing for its quarterly statement to September, the definite figures of which will scarcely be available to the shareholders and the "Street" for a couple of weeks. Mr. Plummer, however, from his close association with the plant's operations during the past four or five months is in intimate touch with conditions and will be able to present his showing where required in the London market.

The "Street" has been more or less favourably impressed by estimates of what the corporation was likely to show in its quarterly report. While the president rarely makes any "estimates" for the public, there is at least the statement of one of the Steel directors, Sir Henry Pellatt, of Toronto, who recently expressed the opinion that the 1913 earnings would be $1,000,000 higher than last year. "The company was never in such shape as it is today," was his statement.

Realization, however, that the corporation has still a number of problems to face, among them being this matter of new financing to liquidate heavy bank loans, gives rise to confusion of sentiment on the "Street." The corporation's bank loans are estimated at from $3,000,000 to $4,000,000.

In the early part of September it will be recalled that innumerable bear rumours were circulated. The favourite bear report to go out is the possibility of the common dividend being discontinued with each quarter. The directors, however, soon put at rest all fears of the October dividend and they had scarcely more than done so when it was hinted that the January dividend would be passed. That, of course, still remains for the future to determine. But those who know the president know that one of his chiefest concerns is to maintain the dividend policy once established. He will do his utmost within reason, though it is quite possible that unforeseen circumstances may upset his calculations.

Mr. Huntly Drummond who returned this week from an extended stay in London points out that while the demand for English money is greater than the supply at the present moment, those in immediate need can secure capital if they are in a position to pay the price.

Just as expressed by Mr. Drummond, there does not seem to be any doubt in the minds of men in close touch with the financial situation that Mr. Plummer will undoubtedly have to pay well for what borrowing he is able to effect. It is obviously premature to venture an opinion as to the nature the new financing arrangement will take. A new issue of preference stock seems likely.

Mr. Plummer has spent almost his entire summer at the Sydney plant, in constant attendance, watching the working out of the plant under the new extensions which have only been in operation since June 1. He is confident that it will in the ultimate do what is promised of it.

Last year, with net earnings of $4,714,057, the corporation only earned at the rate of 4.30 per cent. on the common stock outstanding, a mere fraction of a margin over the quarterly dividend, as critics were quick to point out. If the corporation can earn this year an additional $1,000,000, as Sir Henry Pellatt has predicted, the financial position would be very substantially altered.

However, the corporation is face to face with the recent reductions in the price of steel products in foreign markets. It is admitted that this may mean a little hardship for a time—and it would seem that the present moment was particularly unfortunate—but Mr. William McMaster, vice-president of the corporation, in an interview, expressed the opinion this week that the situation need not be looked upon with undue concern.

Mr. McMaster does not think that these reductions will have a permanent effect on the steel industry of Canada. It was brought about by a dullness which had come over the market, as an effect of the world wide monetary stringency of the past few months.

"I have known half a dozen such periods," he said, "when steel prices were down to the low level. But every time they have come back equally strong."—Financial Times.

## THE NANAIMO STRIKE.

Judge Howey passed sentence recently on more than two score Nanaimo rioters. The maximum sentence was two years. Many union officers will spend the next year in jail.

Three men and two boys were sentenced to serve two years in the penitentiary, twenty-three were given imprisonment for one year and fined $100 each, and eleven were sent to jail for three months and will have to pay a fine of $50 each. All sentences date from the time of arrest. This means that those sentenced to serve three months will be liberated in about thirty days' time.

Those sentenced to serve two years are: J. J. Taylor, Vice-President of the British Columbia Federation of Labour and Vice-President of the Ladysmith local of the Union Mine Workers of America; Samuel Guthrie, President of the Ladysmith Union; Paul Heaconink, a leader, and two boys, John Morgan, son of a prominent mine foreman, who was also given a jail term, and William Simpson, jr., son of a mine contractor.

Taylor and Guthrie pleaded guilty to having taken part in the disturbances, and gave as their excuse that they headed processions of the union miners which led to disturbing the peace.

### One Year Sentences.

A sentence of one year in jail and $100 fine was imposed upon John Allsopp, J. H. Armstrong, Carl Axelson, E. F. Saugman, William Baul, George Baul, George Baumgartner, Sam Brightman, James Colley, Robert Castar, Peter Kluska, H. H. Langdon, Duncan Mackenzie (Secretary of the Ladysmith Union), Joseph Mairs, jr., James Marshall, Charles Mortimer, Steve Merue, Steve Puyanich, George Porter, William Stackhouse (formerly a lieutenant in the United States army, and a prominent business man of Ladysmith); Martin Stogar, James Wallace, Robert Walkinshaw, and Charles Yogle.

Baul served last year on the Ladysmith City Council, and has for years been closely identified with public movements. He declared in his defence that he had not been out of the house at the time he was accused of taking part in the disturbances.

In connection with those sentenced for participating in the riot, George Pettibrew, International Board member and Organizer of the United Mine Workers, and Walter Nelson, a miner, on a charge of intimidating John Weeks, a mine boss, were found guilty and sentenced to two months in jail.

### To Call Strike Off.

In connection with the coal miners' strike on Vancouver island, it was reported recently that the international headquarters of the Miners' Union have ordered Frank K. Farringdon, an American lawyer unionist, who came to British Columbia and handled the official end of the strike, to stop the strike and have the men return to work. It is said Farringdon tried to stop it, but has failed.—The Globe.

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The Granby Consolidated Mining, Smelting & Power Co., Ltd., is putting in a new water supply system for its copper smelting works near Grand Forks, Boundary district. A reservoir has been constructed at a higher level than that of the works and connection made by pipe-line with a small lake in the mountains, distant a mile and a half from the smeltery. The supply of water will be practically unlimited and the pressure will be ample for all purposes.

# STATISTICS AND RETURNS

### DOMINION COAL OUTPUTS.

The Dominion Coal Company's production is maintaining a steady advance over last year's figures, although the capacity of the mines is greater than the outputs actually produced, which are being limited by an insufficient labour supply. In September the production was 407,532 tons, comparing with 380,084 tons in September, 1912. The output for the first nine months of the year totalled 3,527,707 tons against 3,321,362 tons in the same period of 1912, showing an advance of over 200,000 tons to the end of the third quarter. The production for October to the fifteenth of the month was 217,000 tons, and for the month the outputs will probably total 435,000 tons, or 10,000 tons greater than the record of 425,000 tons achieved in July last.

From present indications it is probable that the production for 1913 will reach 4,750,000 tons. The steady increase in the tonnage obtained from the Glace Bay collieries may be seen from the following tabulation.

| Year. | Production in tons. | No. mines on full production |
|---|---|---|
| 1908 | 3,555,068 | 10 |
| 1909 | 2,734,774 (strike) | 11 |
| 1910 | 3,526,754 | 12 |
| 1911 | 3,984,749 | 13 |
| 1912 | 4,513,269 | 15 |
| 1913 | 4,750,000 (Est.) | 18 |

The workings of No. 17 colliery are practically unwatered, but it is not probable that any large amount of coal will be mined in 1913. By next spring, however, the colliery should rank as an important producer. The railway branch to this mine is approaching completion, and fifty miners' houses are about ready for occupation.

No. 11 colliery, which was unwatered only this year, is now producing between 7,000 and 8,000 tons monthly, and will continue to rapidly increase in output.

No. 22 colliery has now an electrically driven air-compressor and is equipped with mining machines. The output, which is at present running around 6,000 tons per month, will rapidly increase, and by next spring this colliery should be producing between 12,000 and 15,000 tons monthly.

### NINE MONTHS' DIVIDENDS.*

In no other nine months' period in the history of American mining and metallurgy have mines and works shown as large dividend disbursements as those in the period just ended. And this too, despite the general belief that the present year has not been a profitable one as relating to mining. When 146 companies, looking to the operations of mines for their profits, can pay in nine months, $78,772,652, it would seem that there has been little reason for the pessimism prevailing. Compared with the same period in 1912 there is shown an increase in the amount of dividends paid of $12,972,109, and with 1911 an increase of $17,993,232. In the 1913 period 146 companies participated, while in 1912 there was 138, and in 1911, 123. In total dividends paid the 146 companies paying dividends in 1913 have to their credit disbursements amounting to no less than $896,232,195.

The copper properties, 34 in number, have had a particularly satisfactory nine months' period, despite the strike in the Lake Superior region, for dividends were paid totalling $38,270,115. This shows an increase over the same period in 1912 of $9,449,687. Since incorporation these companies have divided among shareholders $420,434,064.

The properties classed as gold-silver-lead-zinc producers, too, have had a fairly prosperous nine months' period, for 106 of these yielded profits sufficient to pay to shareholders $28,406,999. To date these companies have paid dividends totalling $333,097,467.

Six metallurgical companies disbursed during the period $12,095,538 and 10 securities-holding corporations $18,707,042.

The accompanying table gives the amount of dividends paid by Canadian companies during September, the date of payment and the amount per share.

| September Dividends. | Sept. | Amount per share. | Total |
|---|---|---|---|
| Crown Reserve, Ont. | 15 | .02 | 39,999 |
| Granby, B. C. | 2 | 1.50 | 224,977 |
| Hedley, B. C. | 30 | .50 | 60,000 |
| Hollinger, Ont. | 2 | .15 | 90,000 |
| Hollinger, Ont. | 30 | .15 | 90,000 |
| International Nickel, com. | 2 | 2.50 | 195,000 |
| Kerr Lake, Ont. | 16 | .25 | 150,000 |
| Timiskaming & Hudson Bay | 22 | 3.00 | 23,283 |
| Yukon Gold | 30 | .07½ | 262,500 |

### COBALT SHIPMENTS.

The ore shipments for the week ending Oct. 18, were:

| | High | Low. | Total |
|---|---|---|---|
| Nipissing | 0 | 2 | 131,610 |
| McKinley | 1 | 0 | 65,900 |
| Cobalt Townsite | 1 | 0 | 76,700 |
| Cobalt Lake | 1 | 0 | 64,090 |
| Totals | 3 | 2 | 338,300 |

The bullion shipments for the week ending Oct. 18 were:

| Mine. | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 72 | 85,055.05 | $50,843.13 |
| Buffalo | 60 | 60,802.00 | 37,000.00 |
| Crown Reserve | 59 | 64,004.00 | 38,401.00 |
| Dom. Reduction | 19 | 21,489.00 | 13,108.00 |
| Wettlaufer | 14 | 11,154.00 | 6,832.00 |
| Trethewey | 3 | 1,670.00 | 1,018.00 |
| City of Cobalt | 3 | 1,053.00 | 649.00 |
| | 230 | 245,227.05 | $147,851.13 |

The bullion shipments for the year to date, are:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 4,834,991.38 | $2,770,722,58 |
| Penn-Can. | 14,141.60 | 8,456.90 |
| Buffalo | 1,301,409.00 | 809,301.57 |
| Crown Reserve | 428,060.00 | 261,278.25 |
| Dom. Red | 373,672.40 | 216,385.15 |
| Townsite | 36,818.40 | 30,364.04 |
| Miscel. | 3,920.00 | 1,623.90 |
| Timiskaming | 25,561.70 | 14,023.04 |
| O'Brien | 146,542.77 | 78,423.66 |
| Wettlaufer | 15,869.00 | 9,757.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial | 635.00 | 374.00 |
| Trethewey | 15,199.83 | 9,300.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 67,817.79 | 40,873.48 |
| Bailey | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| City of Cobalt | 2,808.45 | 1,702.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| Lumsden | 1,814.40 | 1,079.00 |
| Beaver | 1,837.00 | 1,138.94 |
| | 7,291,826.88 | $4,316,650.75 |

*—Mining and Engineering World, Chicago.

# MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

October 22, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 4.25 | 4.50 |
| Alaska Gold | 23.75 | 24.00 |
| British Copper | 2.37 | 2.50 |
| Braden Copper | 7.25 | 7.37½ |
| California Oil | 188.00 | 191.00 |
| Chino Copper | 41.00 | 41.50 |
| Giroux Copper | 1.12 | 1.37 |
| Green Can. | 5.50 | 6.50 |
| Granby | 73.25 | 73.50 |
| Miami Copper | 23.12½ | 23.25 |
| Nevada Copper | 15.75 | 16.00 |
| Ohio Oil | 129.00 | 131.00 |
| Ray Cons. Copper | 19.12½ | 19.25 |
| Standard Oil of N. Y. | 145.00 | 147.00 |
| Standard Oil of N. J. | 378.00 | 380.00 |
| Tonopah Mining | 1.62 | 1.75 |
| Tonopah Belmont | 7.18 | 7.31 |
| Tonopah Merger | .59 | .60 |
| Inspiration Copper | 15.25 | 15.37½ |
| Goldfield Cons. | 1.37½ | 1.50 |
| Yukon Gold | 3.12 | 3.30 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .00¾ |
| Dome Extension | .06 | .07 |
| Dome Lake | .16¾ | .17 |
| Dome Mines | 9.75 | 10.25 |
| Eldorado | .... | .01 |
| Foley-O'Brien | .18 | .19 |
| Hollinger | 16.25 | 17.50 |
| Jupiter | .09¾ | .10 |
| McIntyre | 1.90 | 2.00 |
| Moneta | .02 | .04 |
| North Dome | .... | .40 |
| Northern Exploration | .50 | 1.00 |
| Pearl Lake | .12¾ | .13 |
| Plenaurum | .40 | .80 |
| Porcupine Gold | .14 | .14½ |
| Imperial | .01¾ | .02 |
| Porcupine Reserve | .... | .06 |
| Preston East Dome | .01½ | .02 |
| Rea | .15 | .20 |
| Standard | .... | .01 |
| Swastika | .03 | .03¼ |
| United | .... | .01 |
| West Dome | .08 | .10 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey | .07¾ | .07⅞ |
| Beaver | .30 | .31 |
| Buffalo | 2.10 | 2.23 |
| Canadian | .16 | .22 |
| Chambers Ferland | .13 | .14 |
| City of Cobalt | .25 | .35 |
| Cobalt Lake | .48 | .60 |
| Coniagas | 6.90 | 7.10 |
| Crown Reserve | 1.65 | 1.70 |
| Foster | .04 | .05 |
| Gifford | .01½ | .02 |
| Gould | .04¼ | .04½ |
| Great Northern | .11 | .11½ |
| Hargraves | .02 | .02½ |
| Hudson Bay | 68.00 | 72.00 |
| Kerr Lake | 3.90 | 4.00 |
| La Rose | 2.00 | 2.05 |
| McKinley | 1.38 | 1.40 |
| Nipissing | 8.30 | 8.50 |
| Peterson Lake | .27 | .27½ |
| Right of Way | .04 | .05 |
| Rochester | .02½ | .03½ |
| Leaf | .02 | .02½ |
| Cochrane | .30 | .50 |
| Silver Queen | .03 | .06 |
| Timiskaming | .15½ | .16 |
| Trethewey | .30 | .32 |
| Wettlaufer | .06 | .09 |
| Seneca Superior | 2.60 | 3.00 |
| Porcupine Crown | 1.30 | 1.31 |
| Teck Hughes | .26 | .28 |

## TORONTO MARKETS.

Oct. 24—(Quotations from Canada Metal Co., Toronto).
Spelter, 5 cents per pound.
Lead, 5.75 cents per pound.
Tin, 43 cents per pound.
Antimony, 8½ cents per pound.
Copper, casting, 17½ cents per pound.
Electrolytic, 17½ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Oct. 24—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).

Oct. 24—(Quotations from Elias Rogers Co., Ltd., Toronto).
Coal, anthracite, $8.00 per ton.
Coal, bituminous, lump, $5.25 per ton.

## GENERAL MARKETS.

Oct. 22—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $2.00 to $2.15 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.

Oct. 22.—Tin, straits, 40.60 cents.
Copper, Prime Lake, 16.87½ to 17.00 cents.
Electrolytic copper, 16.65 to 16.80 cents.
Copper wire, 17.50 to 17.75 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.40 cents.
Sheet zinc, (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 7.50 to 7.60 cents.
Aluminum, 19.75 to 20.25 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $44.50 to $45.00 per ounce.
Platinum, hard, $50.00 to $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $38.00 per 75-lb. flask.

## SILVER PRICES.

| | *New York cents. | London pence. |
|---|---|---|
| Oct. 11 | 61¼ | 28¼ |
| " 13 | .. | 28¼ |
| " 14 | 61⅜ | 28$\frac{5}{16}$ |
| " 15 | 61¼ | 28¼ |
| " 16 | 61¼ | 28¼ |
| " 17 | 61⅛ | 28¼ |
| " 18 | 61⅛ | 28¼ |
| " 20 | 61¼ | 28$\frac{5}{16}$ |
| " 21 | 61⅛ | 28¼ |
| " 22 | 61 | 28$\frac{3}{16}$ |
| " 23 | 60¼ | 27$\frac{13}{16}$ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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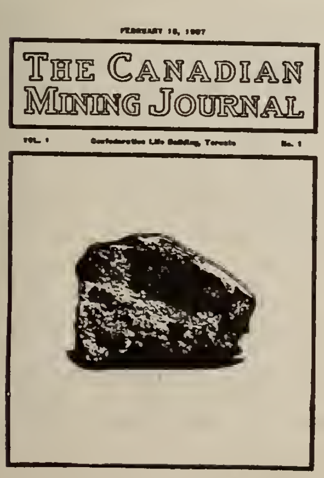


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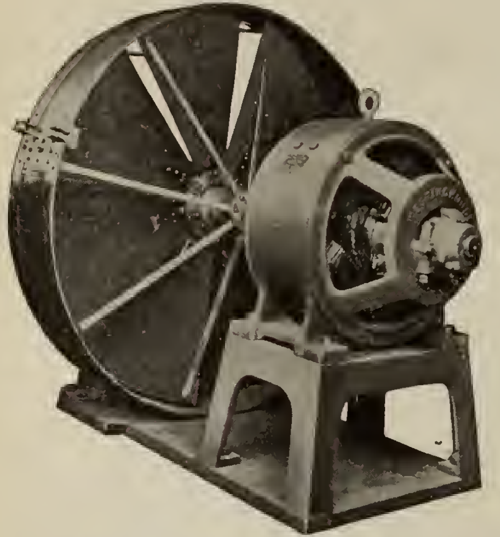

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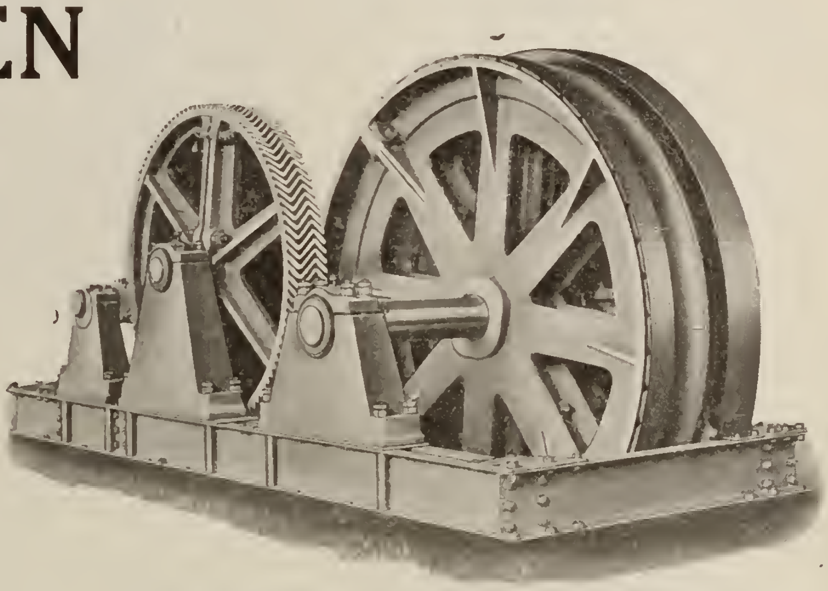

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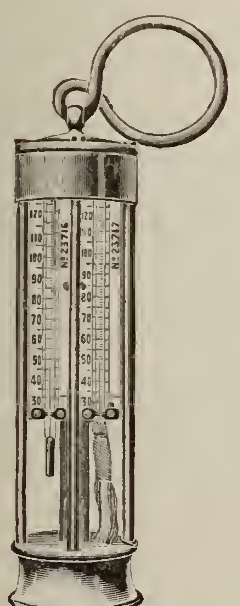

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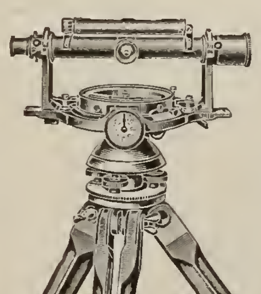

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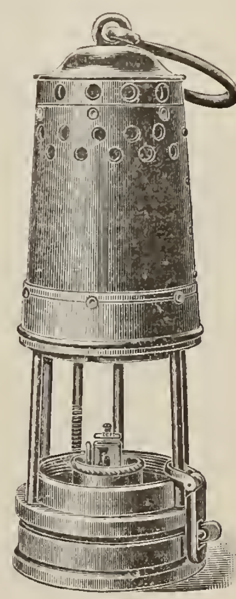

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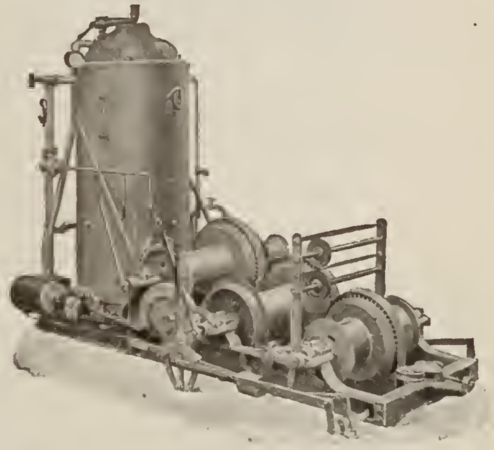

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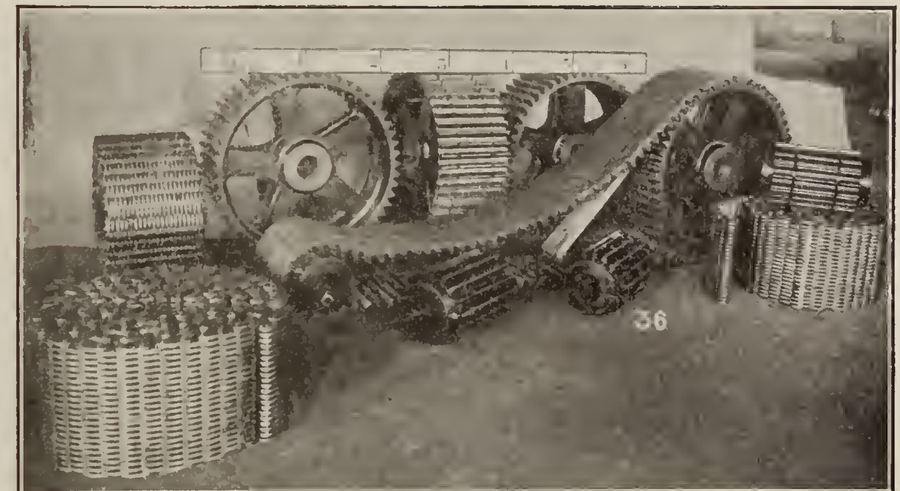


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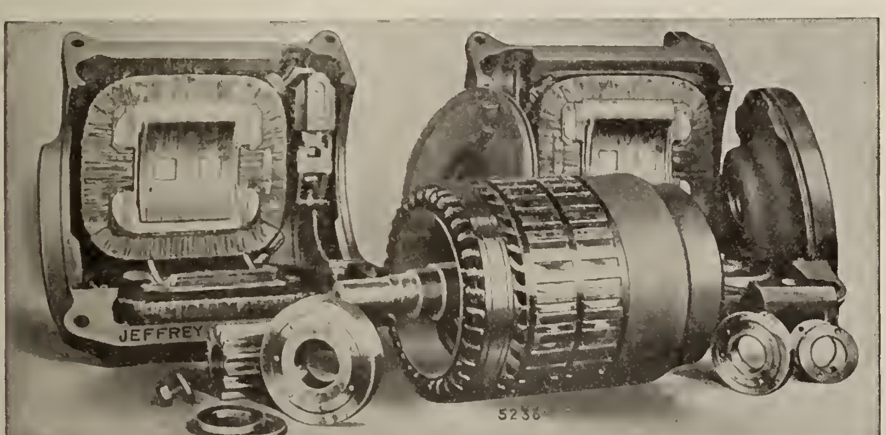


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VOL. XXXIV. TORONTO, November 15, 1913. No. 22

## The Canadian Mining Journal

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*Editor*
REGINALD E. HORE

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CONTENTS.



## MINING IN ONTARIO

Ontario is an important producer of minerals. The silver mines at Cobalt, the nickel-copper mines at Sudbury, the gold mines at Porcupine and many other mines and quarries throughout the province are pouring out a steady stream of wealth.

The industry is flourishing and the producing mines are making good records at a time when money is at a premium. The present condition of the money market is of course affecting exploration work; but the mining industry is making an excellent showing as a producer of wealth, while many other industries are in very unsatisfactory condition.

In our issue of December 1 will be found much interesting information on mining in Ontario. Official statements of production of the numerous metals and non-metals, statements of dividends paid by the several mining companies and descriptions of visits to some of the mining districts will be given. Numerous photographs will be used in illustrating the articles.

## ONTARIO BUREAU OF MINES REPORT FOR 1912

Part one of the twenty-second annual report of the Ontario Bureau of Mines has just been issued. This volume contains the Statistical Review of mining in the Province for the year 1912, which has been prepared by the Deputy Minister of Mines, Mr. Thos. W. Gibson.

Mr. E. T. Corkill, formerly chief inspector of mines for Ontario, reports on Mining Accidents in the province in 1912, and on work done during the year at the various mines.

Prof. A. P. Coleman contributes reports on the Whiskey Lake Area north of Lake Huron, the Massey Copper Mine Area, and on Glacial Phenomena of Toronto and Vicinity.

Mr. J. B. Tyrrell reports on the Hudson Bay Exploring Expedition, which was undertaken for the purpose of selecting lands, waterfront and easements to which the Province of Ontario is entitled under an agreement with the Province of Manitoba. Mr. Tyrrell's return trip was made through the District of Patricia, that part of the District of Keewatin which has been recently added to the Province of Ontario.

Mr. Arthur L. Parsons reports on geological work done in the vicinity of the Lake of the Woods.

Mr. Robert B. Stewart reports on the West Shining Tree Gold Area.

The report of Mr. Stewart appears elsewhere in this issue.

Mr. Frank B. Taylor describes moraines north of Toronto.

In our next issue, which will be a special issue devoted to mining in Ontario, we will publish extracts from several of the other reports.

## WEST SHINING TREE

During the past few years a number of gold-bearing quartz veins have been discovered in the vicinity of West Shining Tree Lake, north of Sudbury. Several parties have done some development work on the claims staked; but there has been little yet done on most of the claims. It is known that there are a number of gold-bearing veins in the area, and the district seems worthy of more attention than it has received.

In 1912, Mr. Robert B. Stewart examined the deposits for the Ontario Bureau of Mines. His report has just been published, and is reprinted in this issue of the Journal. It will be seen from Mr. Stewart's descriptions that coarse gold can be seen in several places in fractured quartz and that fine gold, as determined by assays, is present in a large number of veins. Many of the rich shoots are narrow and not deep, and so far no large body of high grade ore has been developed. Exceedingly rich specimens have been taken from several veins; but they must be regarded as specimens rather than as samples.

Enough has been proven, however, to show that some of the properties are well worthy of systematic exploration.

## PRESENTATION TO DR. W. G. MILLER

On Saturday evening, November 1, a number of mining men met in Toronto at a banquet in honor of Dr. Miller, Provincial Geologist of Ontario.

Some time ago Dr. Miller was asked that the mining men be allowed to present him with a portrait to be painted by Mr. J. W. L. Forster. A committee composed of Messrs. D. A. Dunlap, R. H. Flaherty, H. E. T. Haultain, G. G. S. Lindsey, J. C. Murray, W. E. Segsworth and C. E. Smith called on mining men for subscriptions and made arrangements for the presentation.

The dinner was followed by a number of speeches, the tenor of which was the same—all the speakers showing that both for his services to the mining industry and on account of his splendid qualities as a man among men, Dr. Miller has won the admiration of those who know him and his work.

## THE CALGARY OIL STRIKE

From the article in our last issue, furnished by the Director of the Geological Survey, concerning the recent discovery of oil near Calgary, Alberta, it is evident that while the prospects are distinctly encouraging there is no justification for wild excitement or high prices for oil leases, for nothing is as yet proven. The existence of a commercial oil pool has to be established and something demonstrated as to its shape, extent and depth from the surface before the lands in this vicinity will have much real value as oil lands. What is certain at the moment is that there is a good prospect and that prospecting will cost a lot of money.

On the present showing, intelligently-directed capital will be willing to thoroughly test the prospects, provided it does not have to pay too dearly for the privilege of risking a heavy expenditure. The discovery of a commercial oil field would create business and industry in this section as nothing else could, so that everyone in the west is directly interested in having the oil prospects properly tested, and it would be a calamity if those who would be willing to spend their money in thoroughly and scientifically determining the possibilities of this district were prevented by the designs of mere speculators and, as a result, this opportunity should be lost.

## THE CHISANA (SHUSHANNA) GOLD DISCOVERIES

Canadians, and particularly those interested in the Yukon, were pleased to learn this summer that rich placer gold had been found in the Chisana district, Alaska, a few miles from the Alaska-Yukon boundary.

The section of the Yukon territory immediately adjoining is one which the Geological Survey of Canada considered to be of exceptional promise, and for some years it has had the investigation of the region in contemplation. Circumstances prevented this until the present year when the Canadian Geological Survey despatched two parties into the district, a topographical party under Mr. W. E. Lawson and a geological party under Dr. D. D. Cairnes. These parties were at work in the district when the stampede to the Alaskan placer field commenced, and to correlate the geology of the Chisana with that on the Yukon side of the line, and also to determine whether the gold-bearing gravels are likely to extend into Canadian territory, Dr. Cairnes visited the discoveries in August.

Dr. Cairnes states that rich gold-bearing gravels have been found in an area not exceeding ten or twelve miles in extent. He regards the conditions favourable for the occurrence of similar deposits some distance eastward in Canadian territory.

The original discovery in Chisana district, generally known as the James discovery, is located 30 miles west of the international boundary line, at about latitude 62° 10′ N. and longitude 141° 55′ W. The gold-bearing belt lies along the southern edge of the Nutzotin mountains, and within 25 miles of the northern slopes of the snow and ice-capped Wrangell mountains which include several peaks exceeding 12,000 feet above sea-level, the highest of which—Mount Sanford—rises to a height of 16,200 feet above the sea. The Chisana gold deposits, situated as they are near the headwaters of the White and Tanana rivers, are in a district which is very difficult to reach and may be considered one of the least accessible portions of Alaska.

Five main routes to Chisana are available, two of which may be considered as Alaskan, and the remaining three as Yukon routes. The two Alaskan routes are respectively by way of the Copper River and Northwestern Railway, and the Tanana river.

All three of the Canadian routes proceed from tidewater at Skagway, over the White Pass and Yukon Railway to Whitehorse, a distance of 110 miles. From Whitehorse, the routes diverge and may be named the Kluane, Coffee Creek, and White River routes, respectively.

# WILLET G. MILLER

Provincial Geologist, Ontario.

By H. Mortimer-Lamb.

Were I invited to name a man to worthily exemplify a Canadian of the highest type, I should have no hesitation in indicating the Provincial Geologist of Ontario. In point of lineage, Dr. Willet G. Miller is a more representative Canadian than many of us, for both his father and his father's father were native born; and relatively few in this Dominion can lay claim to this distinctiveness. In him too the influences of descent and environment are markedly manifested, for one instinctively associates Miller with Canada. He is not only essentially a product of the country, but he typifies it. He is a big man physically and intellectually; and his heart, though he carefully guards the secret, is as big as his body. His manner is reserved and even shy, and he is a thinker rather than a talker; yet when occasion demands he can speak with fluency and to the point. He has a well-developed sense of humour, and there are not many better judges of human nature. His sterling uprightness of character, his absolute integrity, his generosity and his disregard for money, are among the qualities that have won him respect and esteem. Few men have fewer enemies; few can boast a greater number of loyal friends. It is impossible to know him or to work with or for him, without giving him one's regard. He is a man who inspires confidence and affection. His scholastic career at the University of Toronto, and at the Universities of Chicago, Harvard and Heidelburg, was distinguished and brilliant. Later as a professor of geology in Queen's University he demonstrated for nearly ten years, his ability as a teacher; and he was beloved by his students. Between the years 1897 and 1901, he was in charge of field work in Eastern Ontario for the Provincial Government, and his report on the corundum occurrences led to the development of the area and the establishment of the industry. In 1902, resigning his professional duties, he accepted the office of Provincial Geologist and Inspector of Mines. It was work for which he was peculiarly adapted both by natural inclination and training. He had specialized in economic geology, and his whole energy was directed to turning his knowledge to account in the interests of the mining industry. What he has accomplished is on record. The achievement is a notable one. Incidentally it may be mentioned that in 1902 the value of the mineral industry of Ontario was $13,391,634 (in 1912 it was $53,127,489. At least some of the credit for this prodigious progress redounds to the Provincial Geologist.

Dr. Miller was the first to recognize the importance of the silver discoveries in Cobalt. It was by following his advice that more than one man became a millionaire. Dr. Miller might also have become rich. He received numerous tempting offers to resign his post and accept in exchange interests in properties and handsome retaining fees from mine owners who competed for his services; but it was all to no purpose. He is indifferent to money making; his heart is in his work. His classification, by-the-way, made in 1904, of the Cobalt rocks stands to-day with but minor modifications. From the first he expressed a preference for veins in the conglomerate as distinguished from those in the Keewatin and diabase as sources of silver production, and expressed the opinion that in passing from the conglomerate to the Keewatin the silver values would tend to diminish. These views have since been substantiated. His maps of the area, in the compilation of which, however, his assistant, Mr. Knight, materially helped, have proved of the greatest value in the development of the district. In 1908 he was elected President of the Canadian Mining Institute, an office he held for two years. These were the two most active years in the Institute's history. He was the ideal president—tactful, resourceful, progressive, energetic. Other honours have been showered on him. He was made an honorary member of the Institute of Mining and Metallurgy, a Doctor of Laws of Queen's University, a Fellow of the Royal Society of Canada, and still more recently an LL.D. of the University of Toronto. The mining men of Canada have subscribed that his portrait may be painted and hung permanently in the halls of the Legislature Building of Ontario.

But these things count for relatively little. Honours as great have been bestowed on smaller men. The reward of such as Dr. Miller is the consciousness of work well done and of friendships well earned.

Since writing these few lines of appreciative testimony, I have received a letter from one high in authority who has been associated officially with Dr. Miller for many years. I quote a paragraph from this letter as an appropriate corollary. My correspondent writes: "In describing Professor Miller's work I would say generally that his mind is conservative in its tendencies and he is not inclined to be sanguine or optimistic, but in interpreting the difficult and confusing pre-Cambrian geology of Ontario, in working out the relationships of ore deposits to the enclosing rocks, and in deductions from field and petrographic evidence, no more brilliant record has been achieved by any geologist in America. Mining men in Ontario have come to regard Miller as practically an oracle on Ontario geology, and his opinion once expressed is regarded as second to none in authority.

# WEST SHINING TREE GOLD AREA*

By R. B. Stewart.

Late in May, 1912, the writer was instructed by the Provincial Geologist of Ontario to proceed to West Shining Tree and continue the examination of that area made during September, 1911. Mr. Dowler Freeman served as assistant.

Transportation facilities have improved during the year. The regular train service on the Canadian Northern railway has been extended to Ruel, sixty-six miles from Sudbury. Two dams were built in the fall of 1911 on the Opickinimika river in order to deepen its shallow portions. This enables small gasoline boats or pointers to run from Ruel to the north end of Allin lake, which is 1½ miles from West Shining Tree lake. Mr. Thomas Clemow, of Ruel, had two boats on the route during the season, giving a tri-weekly service to West Shining Tree lake.

A wagon road will be built during the coming season into the area from mileage 80 on the Canadian Northern railway.

Mr. John Moore, of Sudbury, has established a general store and accommodation for travellers on the south side of West Shining Tree lake. In September, a post office (Tungsten) was established at the store with Mr. Moore as postmaster.

During the year considerable development work has been done. Assessment work was performed on a large number of claims, and a number of the most promising properties and adjacent holdings have been surveyed. In several places, shafts 20 to 50 feet deep have been sunk, and in other places open cuts have been made, chiefly on properties under option.

**Geology of the Area.**—The rocks of the area are chiefly of Keewatin age. They consist of ellipsoidal basalts, altered diabases, ampibolite and hornblende schist. The ellipsoidal rocks predominate. Small areas of quartz porphyry, syenitic porphyry and felsite resembling rhyolite are also present.

A schistose structure exists in most of the Keewatin, but is most pronounced in narrow shear zones that have a general east-west trend, and the developed schists dip nearly vertical. Ferruginous calcium and magnesium carbonates are present in much of the schist.

A lamprophyre dike cutting the older Keewatin rocks was observed on the boundary between Churchill and McMurchy, about 20 chains from the southwest corner of the latter township.

Numerous dikes and small areas of fresh quartz and olivine diabase are found in the area. The diabase dikes intrude all other rocks, and also cut the gold-bearing veins.

**Auriferous Quartz Veins.**—A large number of quartz veins occur in the Keewatin rocks and many of them contain visible gold. Most of the veins are in the ellipsoidal basalt, but two gold-bearing veins have been found in the hornblende schist.

The veins vary in width from 15 feet to a few inches, but most of them are less than 4 to 6 feet across in the widest parts. They present little uniformity in width. They pinch out or narrow to mere stringers in a few yards, then widen again or break up into stringers. The dip of the veins is usually nearly vertical, but several dip at much lower angles—45 degrees or less.

Considerable variation is presented in the strike of the veins. Many veins occur in the east-west shear zones and conform in a general way to the strike and dip of the enclosing schists. Others having an approximate north-south strike occur in the more massive rocks.

Several irregular masses of quartz or quartz and schist occur. The largest one that has been found, so far, is on W.D. 1157. It is roughly 160 feet long and 60 feet wide.

The veins and adjacent country rock are usually well mineralized with iron pyrites. Specular hematite and barite are sometimes present. Much rusty decomposed material resulting from the oxidation of the pyrites and the decomposition of the ferruginous carbonates is almost invariably associated with the veins.

Several small areas of felsite and porphyritic syenite are found in the vicinity of the veins just east of West Shining Tree lake. The latter rock occasionally contains many stringers of quartz cutting it in a very irregular manner and sometimes veins of quartz 3 to 4 feet wide.

Gold occurs in many of the quartz veins and to a small extent in the enclosing schists. Much of the gold in the quartz is in a fine state of division, but nuggets several grains in weight are frequently found. Examination of several specimens showed that a large amount of the gold has been deposited along fracture lines in the quartz. The schist immediately adjacent to the veins appears to be impregnated with quartz to a certain extent, and contains some gold, but assays of several samples of schist taken in the vicinity of the veins do not indicate that the amount of gold in the schist is of importance.

### Gold Claims.

**Gosselin.**—The mining locations, W.D. 1151-52 and W.D. 1155-56-57-58 and 59, are commonly known as the Gosselin claims. The first discovery of gold in the area was made on these claims. A mass of quartz about 160 feet in length and 60 feet wide occurs on W.D. 1157. Gold has been found in this outcrop. Just east of this quartz body is a vein 3 or 4 feet wide, striking about north and uncovered for about 100 feet. About three chains to the north of this vein is a mass of quartz 50 feet long and about 15 feet wide that contains some visible gold, and immediately east of here on W.D. 1175 is a mass of quartz extending 70 feet in a northeasterly direction and about 15 feet wide. Near the northern boundary of W.D. 1151 is a vein 1½ to 2½ feet wide, having an east-west strike and dipping to the north at about 45 degrees. Gold was observed in this vein. Another vein has been located southeast of this claim and extends into W.D. 1156. It has been traced for 8 or 9 chains. The vein strikes a little west of north and varies in width from a few inches to 15 feet. Gold was seen in several places. This is a promising looking vein.

A Duluth company had an option on the properties early in the year. Surface work was carried on to determine the extent of the quartz bodies and these were

*From 22nd annual report Bureau of Mines, Ontario.


Geological Sketch Map of West Shining Tree Gold District. Prepared by R. B. Stewart, for Ontario Bureau of Mines, 1913 systematically sampled. A shaft was put down 50 feet on the incline on the east-west vein on W.D. 1151.

**Caswell Claims**—Claims W.D. 1418-19-20-21 constitute the Caswell property. They are situated west of lake Wasapika, in MacMurchy township. Several veins have been located, but the one which has attracted most attention occurs on the south end of W.D. 1410 and appears again across the lake on W.D. 1418. The vein is of the east-west type and is seldom over a foot wide. The rusty weathering schist alongside the vein contains many stringers of quartz.

The claims were under option during the winter. Most of the development work carried out was done on the vein described above. An open cut 25 feet in length and 12 feet deep at the face was put in on the east shore of the lake on W.D. 1420. Some very fine specimens of gold were obtained, but the work was discontinued when the option had expired.

**Seville Claim.**—Claim W.D. 1417 is located west of the south end of lake Wasapika. The outcrop of a vein that appears to strike several degrees west of north occurs near the east side of the claim. An open cut 30 feet in length and 16 feet deep at the face has been made here. The quartz at the face is about 6 feet wide and well mineralized with pyrites. A little gold was observed in the bottom of the cut. The vein pinches out about 30 feet north of the cut, but comes in again for a short distance and then is concealed by the drift. Along the strike of this outcrop another one occurs near the northern boundary of the claim. The quartz is about a foot wide and contains visible gold. Another outcrop 3 feet wide and uncovered for a chain and a half occurs at the south boundary of W.D. 1418. These three outcrops probably belong to the same vein.

**Jefferson Claim.**—The claim is not surveyed. It is situated immediately east of the Seville property. Gold was first found on this property in a vein that occurs on the west side of lake Wasapika. This vein has an east and west strike and dips 60 degrees to the north. It has been uncovered for over a chain. The quartz is about four feet wide, but pinches out several times. Considerable iron pyrites occurs in the quartz. Finely divided gold was observed about the centre of the outcrop.

Six chains west of this vein, another outcrop has been uncovered for about 200 feet. It has a similar strike and dip to the one described, but the quartz is narrow and irregular.

Two chains north of the latter vein, another has been uncovered for about 200 feet. It strikes a little south of east and is nearly vertical. The quartz is about 2 feet wide and maintains its width fairly well. Pyrites is abundant in the quartz. Much gold was observed in many places in this vein.

**The Bennett Claim.**—This claim (W.D. 1406) is situated on the east side of the Montreal river just south of lake Wasapika. During the fall of 1911, a vein carrying visible gold was discovered along the eastern side of the claim and running into the adjoining property. It appears to strike about northwest, and has been uncovered for about four chains. The quartz in the vein is seldom over a foot wide, but many stringers occur in the vicinity of the vein. Gold was observed in several places in the quartz. An option was secured on the property to the east, and a shaft 34 feet deep was sunk just east of the line. Encouraging quantities of gold were found in the quartz taken from the shaft. This vein occurs in the ellipsoidal greenstone.

**Knox's Claim.**—This claim is located east of lake Wasapika. Several veins varying in width from three to fifteen inches occur in a greenish-gray schist. Their general strike is a little north of east. Coarse gold was observed in one of the veins.

**MacDonald and MacIntyre Claim.**—This property is located just south of lake Wasapika. Very little work has been done on it during the year. Outcrops of quartz and small areas exposed by surface work extending a distance of 8 to 10 chains seem to indicate the existence of a vein running southwest from the west side of the Montreal river and gradually bending to the west. The quartz is four feet wide in places. No gold was observed in this vein, but farther north a vein has been uncovered for a short distance that contains considerable free gold. The latter veins seems to strike west of north and dips to the east. It is two feet wide in some parts. The formation is rather massive greenstones, but some schistosity is developed. Much rusty material occurs in the vicinity of the veins. An option was taken on the property in September, and a shaft was commenced on the vein where the free gold occurs.

**Moore and MacDonald Claims.**—These claims are situated in the vicinity of Moore lake. Several east and west shear zones, 60 feet wide or more, have been located on the properties. The shear zone on W.D. 1164 has been traced for 9 or 10 chains. What is apparently a continuation of this one has been located on W.D. 1163 and on W.D. 1427. Similar areas have been located on W.D. 1171. These shear zones contain many quartz veins and stringers, and are usually well mineralized with iron pyrites. The quartz is seldom over a foot wide, and constitutes a small fraction of the mineralized areas. Much rusty, leafy schist adjoins the quartz and good colors can frequently be obtained from this material on panning. Considerable gold was observed in the quartz veins and stringers on W.D. 1171.

**The MacQuire Claim.**—This claim is located south of the southwestern bay of West Shining Tree Lake. Several veins 8 to 10 inches wide occur in hornblende schist and are uncovered for a short distance. The veins dip to the north. A large amount of iron pyrites occurs in the quartz and schist. It is reported that rich samples of gold were obtained here.

**Holding's Claim.**—In September of this year, Mr. R. Holding, of Chapleau, made a promising discovery of gold west of the south end of MacDonald Lake. The formation here is amphibolite and hornblende schist. Gold occurs in the quartz and decomposed schists. Surface work was in progress when the writer left the field.

**Surveyed Claims.**—Following is a list of mining claims surveyed at West Shining Tree Lake, with the names of their stakers or owners. These are shown on the accompanying map:

Bennett, W.D. 1405-6-7; Beilby, W.D. 1172-74; Caswell, W.D. 1418-19-20-21; Clark, W.D. 1169-70; Coleman, W.D. 1411-12-13; Coombs, W.D. 1175; Coulson, W.D. 1166-67-68; Frith, W.D. 1157-58-59; Fulton, W.D. 1162; Gosselin, W.D. 1151-52; Hanch, W.D. 1430; Johnston, W.D. 1426, 1428-29; Lennon, W.D. 1415-16; MacDonald, W.D. 1163, 1164, 1172; Moore, W.D. 1177-78, 1431, 1165, 1171; Odlum, W.D. 1154; Pendleton, W.D. 1161; Peterson, W.D. 1422-23; Seville, W.D. 1417; Speed, W.D. 1155-56; Thompson, W.D. 1176, 1424-25, 1427.

# PRINCIPLES AND PRACTICE IN TECHNICAL EDUCATION*

By Dr. James Douglas.

My first visit to Colorado was made in 1872. My mission was to report on the California mine in Gilpin County, which had been sold to a Scotch company, and was being restored to the original owners by other methods than those of bargain and sale. As a mine expert I got a lesson in how not to conduct legitimate mining. On the other hand I saw the first successful Western attempt at smelting argentiferous and auriferous copper ores at the old Black Hawk works of Senator Hill; and I made the acquaintance of a brilliant young man, Richard Pearce, in charge of the Swansea Works, at the bend of Clear Creek, below Georgetown. This was only forty years ago, but the changes which have been made in metallurgy since then, suggest many reflections on methods of scientific education, and on the equally important habits in self-training we should cultivate and practise on ourselves.

### Development of Reverberatory Furnace.

Let us glance at these changes. The Boston and Colorado Smelter, under the management of Prof. Hill, who had been a professor at Brown University, started their smelting works in 1867 with two hearth roasting furnaces and two reverberatories of 15 by 9 feet, heated by wood as fuel at $5.00 per cord. The lump sulphides were calcined in heaps. Each reverberatory received its charge of two tons of roasted ore and roasted concentrates, which constituted a self-smelting mixture and yielded a matte of about 40 per cent. in copper. This was shipped to England for refining and separation.

It is Mr. Pearce to whom the credit is due for taking the lead in enlarging the reverberatories, increasing their capacity and reducing the fuel consumption.

Startling as was the progress for that day and generation, it was slow in comparison with the service which of late years has been extracted from the reverberatory, not so much by increasing its size as by improving its operation.

Mr. E. P. Mathewson, in his paper before the recent Eighth International Congress of Applied Chemistry, on the Development of the Reverberatory, says:

"The next step in development was made in Butte, Montana, by the Colorado Smelting Company—this plant being at that time, affiliated with the Argo Works—so that Mr. Pearce's influence was apparent. The step referred to, was the lengthening of the hearth to 50 feet, with consequent increase in capacity to 105 tons in 24 hours."

The first furnace of this size—built from the Colorado Smelting Company's plans—was constructed at the Butte and Boston plant in Butte, in the year 1900.

### Oil as Fuel.

At Cananea, under Dr. Ricketts, the use of oil as fuel and the recovery of waste heat were studied with care. But the highest results seem to have been attained at the plant of the Steptoe Company at McGill, Nevada, with California oil as fuel.

Mathewson says: "A record performance at McGill, communicated by Superintendent Sorensen on December 17th, 1911, No. 1 furnace smelting 660 tons of total charge on an oil consumption of five-eighths of a barrel of oil per ton of charge is as follows:

| | |
|---|---|
| Total charge per furnace day, tons | 666 |
| Oil fired per furnace day, bbl. | 421 .. |
| Coal equivalent of oil fired, tons | 124.0 |
| Total charge per bbl. of oil, tons | 1.58 |
| Oil, bbl. per ton of total charge | .63 |
| Equivalent gross coal, as % of total charge | 18.60 |

The substitution of oil for coal has, from the point of view of cheaper operation and the control of the heat, taken place wherever the difference in the cost of the unit of heat value does not forbid it. The low cost of smelting now attained in the reverberatory is attributable also to the conversion of the waste heat, as it escapes from the throat of the furnace, into steam. This loss has always been recognized, though with the old type of boilers, it was never found practicable to remedy it; but in this as in most other metallurgical processes, the mechanic has co-operated with the metallurgist to consummate what each alone would have failed to accomplish. From forty-five to fifty-five per cent. of the heat generated by the fuel is recovered as steam. The combination of the reverberatory with the blast furnace, instead of the often unreasonable, exclusive preference for the one over the other, is now finding many advocates. At the Copper Queen works at Douglas we use both, and there we have imitated Cananea in fettling our furnaces by pouring i ore of suitable fusibility, along the wall of the furnaces through openings in the roof.

But the development of the reverberatory would not have revolutionized the smelting and refining of auriferous and argentiferous copper ores had not two other great inventions intervened during the short period of time under our review. I refer to the introduction of the pneumatic method, through the Bessemer converter, and the refining of copper by electrolysis.

### The Bessemer Converter in Copper Smelting.

It was about 1882 that the news of M. Manhes' successful application of the converter to the concentration of copper induced Mr. Franklin Farrel to introduce the pneumatic method into his Parrot works in Butte. Difficulties, of course, beset him, but they were so slight that by 1885 he had six stands in successful operation. Since then the principle and main features of practice being accepted, the progress in both concentrating to bullion and incidentally in learning how to smelt crude ore in the converter, has been such that the converter has become more essential to the copper metallurgist than to the steel worker. It has grown in size from 4½ feet in diameter to 20 feet, and from a capacity of one and a half tons of matte per charge to thirty-three tons. Instead of an acid lining requiring frequent replacement, the shell is now lined with basic bricks, so refractory that, under proper precautions, from a single lining 15,000 tons of copper are poured, this first lining being still in use. And, owing to the acid ingredients of the charge, a much wider latitude of ores can be allowed for the acid ingredients of the charge, necessary to eliminate the iron from the matte, than when special clays and quartz had to be selected on account of their plastic or other qualities. The converter has thus become a smelting furnace as well as an appliance to eliminate the older methods of concentration by repeated roastings and smeltings, which involved so much fuel and time and labour. And almost simultaneously with the practical introduction of the converter improvements in the generator to produce electric current in large quantities and cheaply, made the electro-

*Extracts from Commencement Address, Colorado School of Mines, July, 1913.

lytic refining of copper and the separation of all impurities, including gold and silver, possible.

**Refining of Copper by Electrolysis.**

When I was superintendent of the Chemical Copper Co.'s works at Phoenixville, in 1878, Mr. Franklin Farrel, to whom the copper industry owes more than perhaps to any one man of the vanishing generation, induced me to make an experiment in the electrolysis of copper, at first on a small scale, with battery current, and then on a working scale, with generators, and in vats arranged in series and in multiple arc.

Our ignorance was replaced by the knowledge and gracious assistance of Mr. Edward Weston, of Newark, who loaned me three of his nickel-plating dynamos, and, better still, came to Phoenixville more than once to advise

James Douglas, LL.D.

and help me out of difficulties. I suppose I may claim the merits of making, in this country, the first electrolytic copper by the ton, but the merit is really due him, who in this and innumerable other instances has concealed his disinterested work for his favourite science and pursuits under a thick veil of modesty and generosity.

My idea at first was that the cathode might be rolled into coherent sheets. I soon found out my mistake, but the copper was all bought at high figures by the Shaker community, who found that the cathodes yielded an extraordinarily good quality of metal for anodes in their depositing vats. The Chemical Copper Co. was always in difficulty. It started with a shortage of capital, and never covered the shortage. The works came to an ignominious close. The company was not prosperous. The price of copper in 1878 and 1879 was at a low ebb, but took a sudden jump to twenty-five cents before the close of 1879. I had a nice stock of copper on hand and in the vats, and was doing well; but the temptation to realize on such a soaring market was irresistible, and I was ordered to refine everything I could find, at the sacrifice of even the precious metal contents. Excuse this personal digression. It was one of the blind steps in the progress of events which had a momentous influence on your immediate neighbourhood; for the rapidity of the pneumatic process and the perfection of the electrolytic process has inevitably supplanted the more intricate, the more interesting process, from a metallurgical standpoint, of Pearce's modification of the Ziervogel method, as practised first at Black Hawk and then at Argo.

Up to date of Mr. Pearce's alliance with Senator Hill the mattes, as I have said, were shipped to England. And the prices paid for ore and concentrates were low. Fortunately, as a compensation, the value of silver was high. Mr. Pearce, in his Presidential address to the American Institute of Mining Engineers in 1889, gives the proportion of values paid the miners in those early days. He says:

**Proportion of Values.**

"The following table, which I have prepared from data collected by a friend, will show the commercial advantages which the miner has experienced by the progressive development of the smelting industry. For the sake of comparison, I have selected ores which have no special value as fluxes, or as aids to smelting, and will consider them merely in relation to their intrinsic value, and endeavour to show the returns which the miner gets now, as compared with the figures of eighteen years ago. In other words, the net percentage value of an ore to the miner to-day is compared with the value for successive periods from 1871. The value of the silver has been figured from $1.29 per ounce in 1871, down to 93 cents in 1899, and, for the years prior to the resumption of specie payment, the premium on gold is taken into consideration. The slight falling off in 1874 and 1875 was due to the depression following the financial panic in the fall of 1873. For a time, silver-ores were rather a drug on the market and prices consequently fell off.

**Table Showing Percentage of the Total Value of Ores Paid to Miners Each Year During a Period of Eighteen Years.**

| Place. | Year. | Contents in Silver per ton. | Percentage of total value paid to the miner. |
|---|---|---|---|
| | 1871 | 100 oz. | 65. |
| | 1872 | " | 65. |
| | 1873 | " | 65.5 |
| Black | 1874 | " | 53.6 |
| Hawk | 1875 | " | 60. |
| | 1876 | " | 67.2 |
| | 1877 | " | 64.3 |
| | 1878 | " | 65. |
| | 1879 | " | 70. |
| | 1880 | " | 74. |
| | 1881 | " | 74. |
| | 1882 | " | 76. |
| Argo | 1883 | " | 76.5 |
| | 1884 | " | 81. |
| | 1885 | " | 77. |
| | 1886 | " | 80. |
| | 1887 | " | 80. |
| | 1888 | " | 82. |
| | 1889 | " | 84. |

"The difference between the maximum and minimum is 30.4 per cent.

"I have avoided making any figures to show the changes in value of gold-ores from year to year, but, without going into details, I may state that a Gilpin County gold-ore which would net the miner 53 per cent. of its value in 1870, would now yield him 80 per cent., a difference of 27 per cent. and, on a somewhat lower grade of ore, the difference is 33 per cent."

Since then the gold would yield the miner 90 per cent.

Comparing the prices paid for tailings in 1874 and 1889 he quotes 24 per cent. of the value as that of 1874 and 78 per cent. as that in 1889.

Prof. Hill in 1872 defended himself in the Central City Register against the accusation of extortionate charges based upon unjust comparison of his furnace treatment with California milling practice. The Professor says:

"The Boston and Colorado Smelting Company are treating ores, of which the gross value of the gold and silver estimated in currency, is \$50, \$100, and \$150, at a cost to the miner of \$35, \$40, and \$45 respectively, that is, for ores which contain \$50 per ton, currency value, all over \$35.00 is paid to the seller, and for ores containin \$100 per ton, also all over \$40 is paid to the seller, and so on. For intermediate grades a pro rata charge is made.

"This company also pays for the copper \$1.50 for each per cent. on the dry Cornish assay, which is the assay on which all copper ores are sold.

"No one who is acquainted with the facts will deny that the ores of Colorado are the most complex which are worked on this continent, containing, as they do, mixed with the sulphurets of copper and iron, large quantities of the sulphurets of antimony, arsenic, zinc and lead, and a refractory gangue. Neither can any one deny that the actual costs of all the principal elements employed in smelting, viz., fuel, labour, fire bricks, and iron, are more than double here what they are east of the Mississippi River, and much higher than they are in California.

"Dr. Raymond, in his report as Commissioner, for 1870, gives the following as the scale of prices paid at the Hill works:

| For ore containing per ton | Is paid of the value. |
|---|---|
| 2 ounces gold | 20 per cent. |
| 3 ounces gold | 30 per cent. |
| 4 ounces gold | 40 per cent. |
| 5 ounces gold | 45 per cent. |
| 6 ounces gold | 50 per cent. |

"For silver, seventy-five cents per ounce is paid, after deducting as many ounces of silver as there are per cent. of copper in the ore. For copper \$2 for each per cent., deducting one-half per cent. from the amount indicated by wet assay. No account is taken of quantities less than one ounce of silver, one per cent. of copper, or one-quarter ounce of gold. The above rates are in coin."

In 1875 Prof. Egleston published a paper in the Transactions of the American Institute of Mining Engineers on the Boston and Colorado Smelting Works, after Mr. Pearce had joined Prof. Hill and was separating the precious metal. His description is significant of the small scale on which work was still conducted, and the high terms on which ore was bought. He says:

"The works are thus located in the very centre of the gold and silver producing regions of Colorado, and are also most favourably situated with regard to transportation. They treated in 1874, 30 tons of ore and tailings in 24 hours, and produced 700,000 ounces of silver, 12,000 ounces to 15,000 ounces of gold, and 225 tons of copper. With matte from Alma their production in 1875 will be 110,000 ounces of silver, 25,000 ounces of gold, and 250 tons of copper.

"The gold ores are divided into three classes. The first class consists of auriferous copper pyrites containing from 2 to 10 per cent. of copper, 2 ounces to 10 ounces of gold, and 2 ounces to 10 ounces of silver. These ores average 4 per cent. of copper, $3\frac{1}{2}$ ounces of gold, and 6 ounces of silver. The second class are tailings from the gold mills, consisting of pyrites with about $1\frac{1}{2}$ per cent. of copper, $1\frac{1}{4}$ ounces of gold, and 4 ounces of silver. The third class consists of tellurium ores, which have a very silicious gangue, and contain 100 ounces to 200 ounces of gold, and 6 ounces to 10 ounces of silver. These ores come mostly from Boulder County, and are often worth \$10,000 to \$15,000 to the ton.

"The silver ores of the first class consist of surface ores, mostly free from sulphur, containing 70 per cent. of silica. They contain 100 ounces of silver and 5 to 6 per cent. of lead, and no gold. Those of the second class are sulphurets, rich in blende and poor in galena and pyrites; they contain 150 ounces of silver, 15 per cent. of zinc and lead, and no gold."

The next contribution to the literature of our subject was the Presidential address from which I have quoted.

By that time the smelting industry of Colorado had expanded from about 20,000 tons per year in 1877 to 596,594 tons in 1888, and Argo was treating some 200 tons of copper bearing material from all sections of the Rocky Mountains, including the matte from the company's famous branch works in Butte, operated under the superintendence of Mr. Williams. When Mr. Pearce had introduced the Ziervogel method, of separating copper and silver, substantially as practised in Germany and England, and his own modification of parting the gold, the heavier expense of shipping the matte to England or Germany was avoided, and, as the above table showed, the miners shared in the saving. But the method was delicate, and costly, involving not only skill, but many operations. And consequently it has not been able to compete with matte concentration in the converter, and the perfect separation of the precious from the baser metal in the electrolytic vat. The requiem of this famous enterprise was thus pronounced in "Mineral Resources" for 1910. Part 1, page 196.

"The year witnessed the dismantling of the plant of the Boston and Colorado Smelting Co. and the passing of this pioneer in the copper smelting industry of the West. Although this company had been successful in its long period of operations, the management did not consider it wise to rebuild the plant, which was becoming out of date. This pioneer plant has had a long and successful career, but copper smelting plants constructed in the State in recent years have been far less successful and have been able to operate but intermittently."

The moral in its effect on us as students is to regard methods, even the most ingenious and scientifically perfect, as merely stepping stones across the river of industrial life, the further side of which is still far away.

### Study of Principles Should Occupy a More Prominent Place Than the Study of Practice.

Looking back, therefore, on the changes in these two branches of mining and metallurgy, namely, in the improvements and changes of methods and the higher values which the miner receives to-day for the products of his industry, we are forced to recognize how, in our system of education, the study of principles should occupy a more prominent place than the study of practice. Even our acceptance of principles, outside of mathematics, should be held as open to modification, but in the main the fundamental laws of physics and chemistry may be accepted as we interpret them, to be correct and our only safe guides. Every improvement made in your own region has been through a better understanding of these laws, and carrying them into operation.

For instance, the effect of the injection of air into molten metal was perfectly understood before Bessemer brought mechanical ingenuity as well as chemical science to bear upon the solution of the pneumatic method. The practicability of extracting the carbon to the exact point at which pig iron is converted into steel proved to be so difficult that the Bessemer process would probably have had a limited range of usefulness had not the suggestion of another chemist been adopted, to oxidize all the carbon, then re-add to the charge the specific amount of carbide of manganese with a known quantity of carbon to re-carbonize the iron, while the manganese absorbed any dissolved oxide of iron. The whole success of this momentous improvement, which was no discovery at all, depended upon the application of known facts to meet certain practical conditions.

Following along the line of steel manufacture, the adoption of the basic lining in the converter, following the Thomas Gilchrist proposal to line the open hearth furnace with a basic material to eliminate phosphorus was a simple application of known chemical facts.

Turning from the pneumatic method as applied to iron to similar methods as applied to copper, we see Holloway carrying his smelting of ore and concentration of matte up to the point where metallic copper began to form, then the occlusion of the tuyeres in the bottom of the steel converter by the chilled copper; and the loss of years, in the adaption of this simple method to the concentration of copper, till Mons. Manhes, adopting a type of converter with elevated tuyeres, which Mr. Bessemer had himself patented, brought the tuyeres within reach of a punching bar, and thus substantially revolutionized the metallurgy of sulphides of copper.

The wonderful progress in the study of the generation of electricity, its transmission, its conversion into power, and its electrical action, has been made within the short period we have been reviewing. It is a special branch of study and research, the intricacies of which the average student cannot thoroughly master, but with the general laws of which he should be familiar. The carrying out of any mining scheme which utilizes electricity involves the employment of an expert in the person of an electrical engineer, but if you are to be an efficient manager of a mine, mill or furnace plant you must personally know what can be done with this mighty but mysterious force, though you may have to leave the handling of it to your electrician.

Another element which of late we have called to our uses for service at a distance from the point of its generation, is compressed air. To determine whether in each particular case, transmission by electricity or by compressed air or by a combination of both should be adopted involves on the part of the manager a fair acquaintance with the fundamental laws of electricity and pneumatics, if he is to be the controlling factor in the administration, instead of a puppet in the hands of his subordinate officers. He may not be familiar with all the practical appliances or the latest improvements for applying these principles, but he must be sufficiently master of the subject to be the master of his staff.

There is another field which the mining and metallurgical engineer of the future will have to cultivate, and that is industrial chemistry. It is of course a branch of industry in which co-operation between the chemical manufacturer and the miner and metallurgist must be closer and keener than it is at present. In fact, our metallurgical activity has been greater than the chemical, partly due to the fact that the market for chemical products has been widely distant from the possible sources of some of the more necessary chemical ingredients, which are essential to all large chemical operations.

We are living at the close of a period of almost unnatural activity and prosperity. We have had half the new world to exploit, and, with steam and electricity as our aids, in little more than a generation we have depleted the fertility of the soil and emptied our mines of their richest ore, taking from each the stores nature had accumulated nearest the surface. The harvest has been abundant and cheaply garnered; but a future generation cannot reap crops without planting, and in our case, if mining prosperity is to be maintained, it must be by saving every product and by-product, and widening, therefore, the field of our operations and consequently of our studies.

The experience here of the past generation demonstrates how rapidly practices have changed under the application of scientific principles. The conclusion, therefore, is that, as a fundamental maxim of education, our studies should aim at a better understanding of the deep and broad laws which underlie all practice rather than the ephemeral methods of the day; and thus train our minds in habits of original research rather than obediently and servilely following the practice of the past or even of the present. The study of methods, however, cannot be neglected, but, if familiar with the principles, you are better able to use your principles in assisting you to devise methods for carrying them into practice.

The danger of too much knowledge of principles is that the scholar becomes so conscious of his shortcomings in practice and sees so keenly the possible perfection of practice ahead that he does not devote himself with sufficient energy to working out and practising the imperfect, practicable methods and using tools he has to his hand to work with. Some of the cleverest men I have had to do with have developed this fault. It should be your endeavour to familiarize yourselves with the scientific basis of the subjects you have to deal with without destroying your practical ingenuity and being depressed by the evident shortcoming of your best efforts to carry principles into action.

## ANALYSES OF COALS.

Government purchasing agents, designing and operating engineers, and the fuel departments of industrial concerns, large dealers in coal, and persons interested in the distribution and character of the different coals in the United States, will find valuable information in a report just issued by the United States Bureau of Mines as Bulletin 22, entitled, "Analyses of coals in the United States, with descriptions of mine and field samples collected between July 1, 1904, and June 30, 1910." This report contains the analyses of 5,000 samples of coal taken from 1,500 coal mines and prospects situated in the various coal fields of the United States. Not only all of the important fields are represented, but practically all of the more important mining districts.

The purpose of the bureau in compiling and publishing this information is to present reliable information regarding the chemical composition and heating value of the coals. The samples of coals were collected by experienced men according to a definite and uniform system, and were analyzed under carefully controlled conditions, so that there might be no question as to the relative merits of the different coals so far as this can be determined by chemical analyses and determination of heating values.

# ELECTROMAGNETIC ORE CONCENTRATION BY THE ULLRICH SEPARATOR

By P. Kranafeldt.

The process of concentrating ores was formerly effected almost exclusively by mechanical operations involving the aid of water and known as hydraulic sorting, in which differences in specific gravity furnished the means of separating the component materials. This method fails, however, when components require to be separated which differ but little in their density. Hence ores having components of this kind, such as spathic iron ore associated with zinc blende, spathic iron and copper pyrites and many others could only be concentrated in a very imperfect manner or could not be treated at all. Attempts were therefore made to devise methods of concentration in which other properties of minerals furnished the requisite element of dissimilarity, and machines were accordingly designed for classifying the minerals by their different behaviours with respect to magnetic attraction.

Substances are said to be more or less permeable or magnetic according to the degree in which they are influenced, i.e., attracted by, the magnetic poles. The subjoined list of coefficients may serve to convey an idea of the degree of permeability or magnetic strength of a few substances:

| | |
|---|---|
| Metallic iron | 100,000 |
| Magnetite | 40,000 |
| Spathic iron | 760 |
| Red hematite | 590 |
| Iron oxide | 280 |
| Manganite | 180 |
| Nickel oxide | 35 |

Permeabilities of a still lower degree are exhibited by the materials composing the gangue such as quartz, limestone, porphyry, etc. Magnetite is accordingly counted among the strongly magnetic ores, whilst the other metalliferous compounds named in the above list belong to the class of feebly magnetic ores. It should, however, be noted that various minerals such as spathic iron ore, red hematite, iron pyrites, etc., may by roasting be transformed into strongly magnetic compounds.

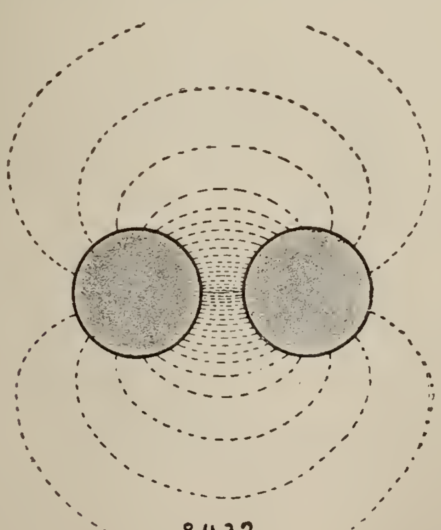



Fig. No. 1

There are two main groups of magnetic separators. In one class the electro-magnets are movable, whilst in the other they are stationary.

**Cylinder Separators.**—The principal representative of the first group is the cylinder separator, in which the poles take the form of two revolving cylinders (Fig. No. 1). The intensity of the field increases gradually until it reaches its greatest value where the two cylindrical poles are nearest to each other after which it gradually declines again. By diminishing the distance between the two poles, the intensity of the field is increased. It is greatest when the gap has been reduced to its utmost limit, which in its turn is governed by the coarseness of the material which has to be passed through the machine. Since the intensity of the field declines gradually from a greatest value it follows that the attracted particles will drop off in succession as they differ in their magnetic qualities. From the description of the process of separation it will, however, be seen that in a machine of this type there cannot be any strict sorting.

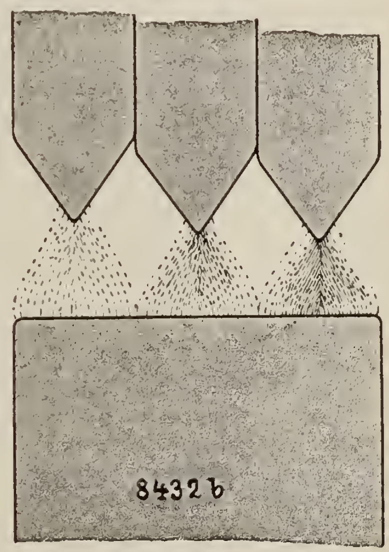



Fig. No. 2

**Stationary Poles.**—More satisfactory are ore separators with stationary poles. They are now almost exclusively fitted with poles designed in the form of V edges. Since the lines of force contract towards the edge it follows that this shape furnishes a means of producing a very intense field and that a V-shaped pole exercises a very powerful attraction. These poles are accordingly particularly well adapted for separating feebly magnetic materials. In the case where a V pole operates in conjunction with a flat pole the zone where the attractive forces due to either pole balance each other is very near to the flat pole, and hence the V-edged pole exercises an attractive force on the greatest part of the field. In separators with stationary poles both the magnetic and non-magnetic components have to be conducted away from the magnetic field by means of belts or other conveyors. With separators of the simple type as here outlined, it is obviously not possible to separate more than two constituents. To deal with more than two components it would be necessary to set up several magnetic poles, one behind the other, so as to create as many magnetic fields. This would add much

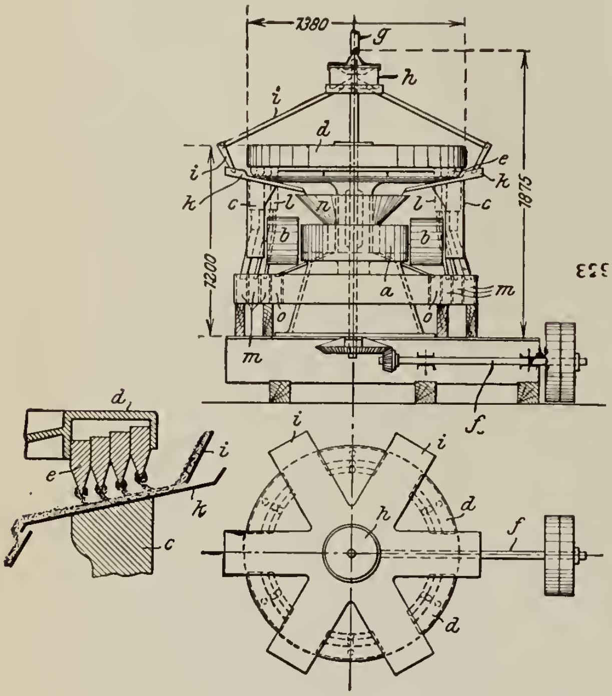


**Fig. No. 3**

to the cost of the machine without being attended with a satisfactory increase of the output.

It will thus be seen that whilst it is possible with the separators described so far to classify disintegrated material into more than two components, machines constructed on these lines yield either an imperfectly sorted material or their initial cost becomes excessive in proportion to the output. Both objections have been overcome by the introduction of the Ullrich Magnetic Separator.*

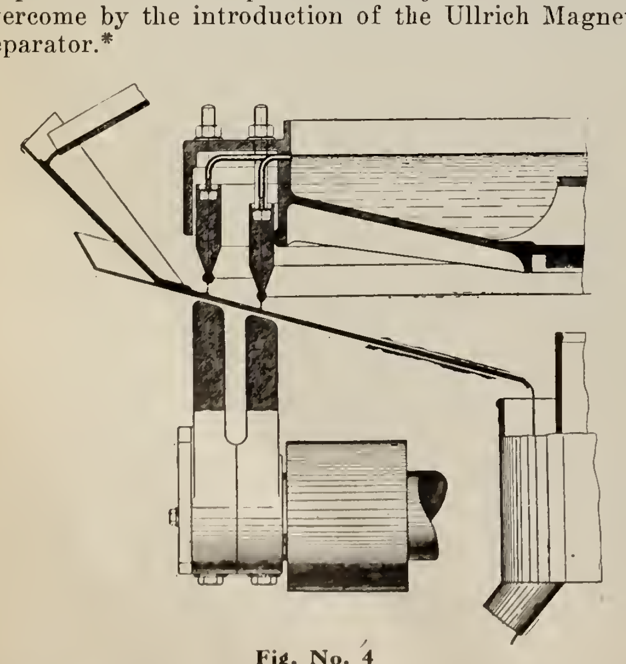


**Fig. No. 4**

**Ullrich Magnetic Separators.**—In these machines there are several magnetic fields, each of which is subdivided into separate zones (Fig. No. 2). These zones can be independently adjusted to a nicety, and, therefore, their intensity so regulated that an individual zone will act on one of the constituents differing but slightly from the former in its magnetic qualities. The Ullrich separator will, accordingly, in each of its magnetic fields, extract from a mixture one or more constituents differing in their degree of permeability and it will deliver these separately; and whilst it can

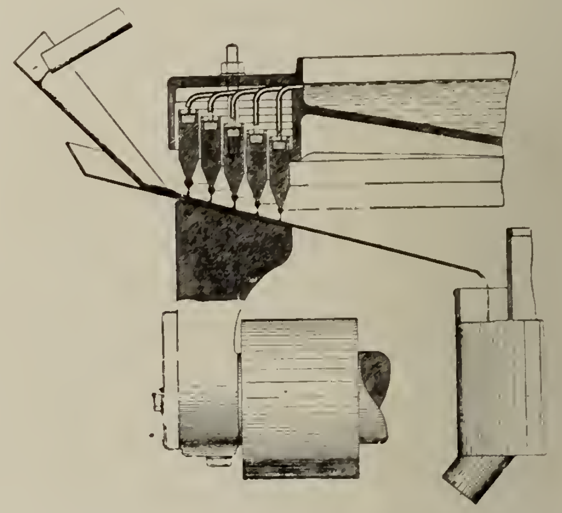


**Fig. No. 5**

deal with large quantities of mixed materials it delivers remarkably pure products.

Before going into the constructive details of this machine attention may be drawn to a feature which distinguishes the Ullrich separator from all other types.

All electro-magnetic separators which had been designed for the treatment of feebly magnetic minerals were adapted for the handling of dry materials only. It will not be difficult to realize that this restriction introduces serious limitations in the application of the machines. We need only refer to the enormous evolution of dust which is unavoidable in machines which deal with dry and finely ground ores with its attendant

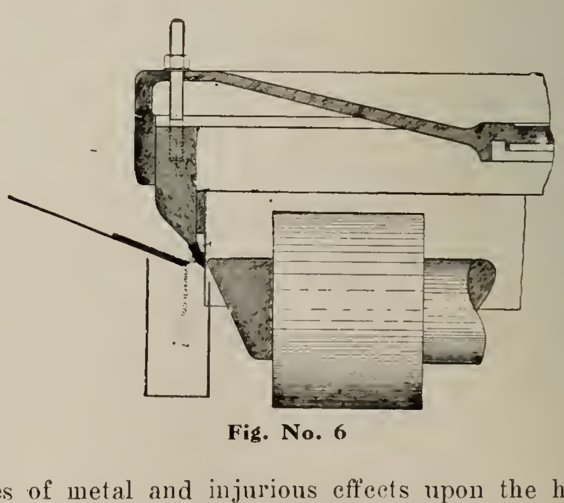


**Fig. No. 6**

losses of metal and injurious effects upon the health of the workmen, etc. The exclusion, as far as feebly magnetic ores are concerned, of the wet process from the scheme of magnetic separation has been all the

*Sole Makers: Fried. Krupp, A. G. Grusonwerk, Magdeburg, Germany; represented in Canada by Jas. W. Pyke & Co., Ltd., 232 St. James St., Montreal.

more serious since in most cases the mechanical and the magnetic processes of ore dressing cannot profitably be separated. On the other hand, ores are dressed almost exclusively by wet methods. In fact, the disadvantages inherent in the dry magnetic method of separation are notoriously such that many ores had to remain unused as it was not possible to concentrate them by any other method. Among ores of this kind are to be found hematite ores, zinc ores, etc.

The Ullrich separator was the first machine to classify feebly magnetic materials under the conditions of the wet process. But as it is available for strongly magnetic material just as well, the scope of its applicability extends to all cases in which magnetic separation may be practicable.

The body (a) sends out a number of radially arranged horizontal arms of soft iron surrounded by the magnet coils (b) and carrying on their extremities adjustable upright pole heads (c). The body (a) supports on ball bearings a revolving disc (d) the rim of which takes the form of a chamber for the reception of the armature rings (e). The disc is keyed upon a vertical shaft and is set in rotation by bevel gearing and a belt drive.

There are either two, four, six, eight or ten pole heads (c) arranged in a circle, providing as many separate magnetic fields. The initial material is generally conveyed to these by shaking feeders actuated by a friction roller in contact with and driven by the rim of the revolving disc (d). In the case of dry material the feeding device takes the form of a band conveyor.

The pole heads may be divided up tangentially to the armature rings into as many adjustable pole plates as there are rings (see Fig. No. 4).

The armature rings (e), of which there are one, two, three, four, five, or six, according to the number of zones required or the number of constituents to be separated, terminate below in V-edges. They rotate above the stationary poles, being suspended by screws from the top of the annular chamber at the circumference of the revolving disc and may, independently of each other, be set at any required height by means of these screws.

The wet separators have the upper portion of the rings made in the form of channels for the reception of water (Fig. No. 5) conveyed to them through small tubes from the container formed by the revolving disc (d) and its rim. The water is discharged through slots in the sides of the channels and in flowing down the sides of the rings serves to clean the products attracted to the rings.

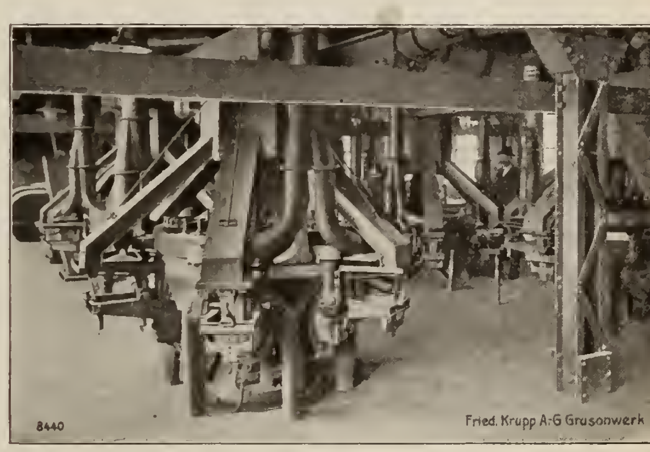
At each magnetic field a feeder passes the material through the active space between the pole and the armature rings rotating above it. When the electromagnets are energized the space between the pole and rings becomes a magnetic field sub-divided into as many zones as there are rings. In consequence of the magnetic force of attraction in the field zones, which may be regulated by raising and lowering the rings or the pole heads, the magnetic constituents are drawn up by the Vs of the rings. In the wet separators the water which flows down the sides of the rings in opposition to the motion of the attracted particles washes down any particles of lower magnetic quality than desired for the particular ring and creates between the poles and the armature hydrostatic columns, within which the separation of the magnetic and non-magnetic constituents is effected without any difficulties being encountered on the score of surface tension.

The particles attracted by the rings are carried by the latter out of the magnetic fields and drop into separate pockets, any particles still adhering to the rings being removed by a spraying device or leather strikers.

In the case of separators provided with one ring only (Fig. No. 6) the material, instead of being passed between the pole and the ring, is merely conveyed up to the magnetic field. The magnetic constituents are then lifted out by magnetic attraction and discharged from the field through the space between the armature ring and the brass ring attached thereto. The non-magnetic constituents drop straight down from the inlet chute.

Machines designed for classifying fine slimes are fitted with stationary feeding channels (k) without shaking mechanism so that the rings can be set very accurately and therefore the components of the slimes can be separated with an exceedingly fine degree of precision.


**WET**




**DRY**

**Ullrich Separators**

The following minerals have successfully been concentrated with Ullrich magnetic separators:

| Minerals. | Separated Constituents. Magnetic. | Non-magnetic. | Remarks. |
|---|---|---|---|
| 1. Strongly Magnetic Ores. | | | |
| Magnetite. | Magnetite. | Gangue. | Apatite, which often forms part of the gangue, is likewise separated out. |
| *Magnetic Iron Pyrites.* | Magnetic Iron Pyrites. | Copper Pyrites. | |
| 2. Minerals which require to be prepared by roasting for the electro - magnetic treatment. These include: Zinc ores containing iron pyrites, copper pyrites in the form of raw ores or washed middlings, tin ores containing sulphur, tin or tungsten ores. | Iron Pyrites. Copper Pyrites. Zinc Blende or Tungsten. | Gangue, Zinc Blende or Tin. | Ores containing Iron Pyrites in which these constituents can be rendered strongly magnetic by partial roasting or calcining with access of air. |
| 3. Feebly Magnetic Ores. | | | |
| *Iron Ores.* | Hematite Ores. Red Hematite Ores. Brown Hematite Ores. | Gangue. | |
| | Spathic Iron Ores. | Zinc Blende. Iron Pyrites. Copper Pyrites. | |
| *Zinc Ores.* | Ferruginous or Manganiferous Silicates. | Zinc Blende. Feebly Magnetic or non-magnetic minerals. | e.g. Broken Hill Tailings containing, besides Zinc Blende, garnets and rhodonite. |
| | Zinc Blende. | (Iron Pyrites) | |
| | Franklinite. | Zincite Willemite. | |
| *Tin and Tungsten Ores.* | Tungsten. | Cassiterite. | |
| *Copper Ores.* | Spathic Iron Ore, Copper Carbonate (if sufficiently magnetic) | Copper Pyrites. Gangue. | |
| | Atacamite. | Gangue. | |
| *Monazite Sands.* | Magnetite. Ilmenite. | Zirconium and other Silicates. | |
| *Concentrates, from jigs, of Diamantiferous Sands.* | Ferriferous Grits or Sands or Ferruginous Silicates (Garnets). | Diamonds. | |
| *Magnesite* | Burnt Magnesite. | Lime, Alumina. | |
| Raw Minerals or Roasted Materials containing as impurities ferriferous minerals. | | | Treated with the object of *cleaning ferruginous sands and clays for the manufacture of glass and pottery.* |

From this list it will be seen that the Ullrich separators not only serve for concentrating ores, but are also well adapted to eliminate ferrous impurities from the raw materials employed, e.g., in the manufacture of glass and earthenware.

The capacity of these separators greatly depends on the magnetic permeability of the ore. In the case of strongly magnetic and coarse-grained material, which may size up to 2 inches, up to 7 tons per hour, may be passed through the machine, whilst with fine material the maximum capacity is about 4 tons. In the case of feebly magnetic materials which may contain pieces up to ⅜ inch diameter, the machines can deal with quantities ranging from ½ to 3 tons per hour.

The power absorbed by the Ullrich separators varies according to the nature of the minerals and ranges from ½ to 2 h.p. The wear is quite insignificant.

The operation of the machine is very simple, and one man can attend ten machines.

Thanks to its merits the Ullrich separator has already met with a considerable measure of success and appreciation. Though it was introduced but four years ago there are already a considerable number of plants operating with Ullrich magnetic separators.

We append a table to illustrate the practical results achieved with these machines:

| Ores | Crude Ores Per cent. | | | Zinc Concentrates Per cent. | | | Iron Concentrates Per cent. | | | Recovery Per cent. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fe | Mn | Zn | Fe | Mn | Zn | Fe | Mn | Zn | Fe | Mn | Zn |
| **Spathic Zinc Blende—** | | | | | | | | | | | | |
| 1. Siegerland | 15.9 | 3.8 | 27.8 | ... | ... | 49.0 | 30.1 | 8.2 | 2.5 | ... | 75.2 | 92 |
| 2. Siegerland | ... | ... | 22.0 | ... | ... | 40.6 | ... | ... | ... | ... | ... | 98.8 |
| 3. Siegerland | ... | ... | 33.1 | ... | ... | 52.9 | ... | ... | ... | ... | ... | 97.5 |
| 4. Sardinia | ... | ... | 38.9 | ... | ... | 55.9 | .... | ... | ... | ... | ... | 92.8 |

| | Crude Ores Per cent. | | Copper Concentrates Per cent. | | Iron Concentrates Per cent. | | Recovery Per cent. | |
|---|---|---|---|---|---|---|---|---|
| **Spathic Copper Ores—** | | Cu | Fe | Cu | Fe | Cu | Fe | Cu |
| Hungarian Ore | 38.9 | 1.01 | ... | 3.97 | 39.8 | 0.131 | 68 | 88 |
| 1. Hungarian Ore (size a) | ... | 3.09 | ... | 6.02 | ... | .... | ... | 84 |
| 2. Hungarian Ore (size b) | ... | 3.75 | ... | 9.60 | ... | .... | ... | 84 |
| Hungarian Ore (size c) | ... | 4.80 | ... | 9.20 | ... | .... | ... | 84 |

| | Crude Ores Per cent. | | | | Concentrate Per cent. | | | | Recovery Per cent. | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Iron Ores—** | Fe | Mn | P | Insoluble | Fe | Mn | P | Insoluble | Fe | Mn |
| 1. Norwegian Magnetite and Hematite Ores of Dunderland (a) | 37.34 | ... | 0.238 | ... | 65.32 | ... | 0.0255 | ... | 80 | ... |
| Iron Ore Co., Ltd. (b) | 27.6 | ... | 0.164 | ... | 64 | ... | 0.0132 | ... | 76.4 | ... |
| 2. Swedish Hematite Ore | 34.6 | 8.9 | 0.349 | 33 | 48.3 | 11.1 | 0.0276 | 12.2 | 79.1 | 70.9 |
| 3. Bohemian Hematite Ore | 56.5 | ... | .... | ... | 68.6 | ... | .... | ... | 93.3 | ... |
| 4. Blast Furnace Dust (American) (a) | 43 | ... | 0.47 | 17.4 | 57.3 | ... | 0.297 | 10.7 | 91.1 | ... |
| Blast Furnace Dust (American) (b) | 43 | ... | 0.47 | 17.4 | 59.1 | ... | 0.25 | 8.5 | 72.4 | ... |
| 5. Roasted Spathic Iron Ore (Siegerland) (a) | 37.2 | 6.9 | .... | ... | 48.1 | 8.5 | .... | ... | 93.5 | 89.5 |
| Roasted Spathic Iron Ore (Siegerland) (b) | 42 | ... | .... | ... | 48.8 | 11.7 | .... | ... | 87 | 86.6 |
| 6. Swedish Magnetite Ore | 34.6 | ... | 0.329 | .. | 51.6 | 8.5 | 0.021 | ... | 88.5 | ... |
| 7. Swedish Magnetite - Hematite Ore | 50.2 | ... | 0.106 | ... | 61.6 | ... | 0.029 | ... | 86.4 | ... |
| 8. Italian Magnetite Ore | 54.5 | ... | .... | ... | 65 | ... | .... | ... | 90 | ... |

Messrs. Jas. W. Pyke & Co., Limited, 232 St. James Street, Montreal, are the Canadian representatives for the Krupp Engineering Works, and will be glad to give any further information to interested parties who may wish to send samples of ore over to the Krupp testing station for examination.

## IRON ORE.

E. C. Eckels, a geologist, giving his testimony in the United States steel hearing, furnished some interesting data on the Newfoundland and Nova Scotia ore deposits. He said that the ore had been located at 1,071 feet below the bottom of Conception Bay, and that the Nova Scotia Iron & Steel Co. is now successfully operating submarine mines. The economically workable ore within five miles of Bell Island is estimated at 3,500,000,000 tons. Besides this, there are billions of tons which are not economically available at this time. In one deposit alone in the Newfoundland district the witness said that the ore runs 30 feet thick and contains about 90,000,000 tons to the square mile.

Mr. Eckels estimated that ore could be brought from the Newfoundland mines to Philadelphia and the eastern steel market at a cost of about four cents per unit. Foreign ore sells at Philadelphia at seven and one-half cents per unit, showing the profit on the Newfoundland ore at Philadelphia and Baltimore. Lake Superior ore cannot be laid down at Baltimore and Philadelphia for less than nine cents per unit, according to the witness, or from two to two and one-half cents per unit more than the foreign product.

# THE GOLD DEPOSITS OF NOVA SCOTIA*

By E. R. Faribault.

**General Character and Distribution.**—The gold in Nova Scotia occurs chiefly in quartz veins, but a small amount of gold has been recovered from detritus. The deposits of auriferous antimony ore occurring in cross-country veins in the Halifax formation at West Gore have been worked considerably for antimony and gold.

The gold-bearing quartz has been reported as occurring in the granite, but the authenticity of the reports may be regarded with suspicion. With this possible exception, all the known veins occur in the sedimentary strata of the Gold-bearing series. Although there are a few important veins that cut across the stratification, most of the auriferous quartz veins are of the interbedded type. They occur chiefly in the beds of slate which are found inter-stratified with the beds of quartzite throughout the whole thickness of the Goldenville formation, and their distribution and structure are to a great extent the result of the action of dynamic forces to which the enclosing rocks were subjected. The interbedded veins are found in great numbers, aggregated in groups on the domes along the anticlines; and in some few cases on the pitching portion of the anticlines. Rarely they are formed in the synclinal troughs. The domes thus determine the location of nearly all the groups of veins and each of them may be considered as an independent gold district. Some domes, however, especially in the west, do not show the presence of quartz veins, but this appearance may be simply due to the concealment of the bedrock by drift.

A tabulation made of the principal anticlines with the gold districts located on them, from the map-sheets published by the Geological Survey, shows that to the east of Halifax 33 gold districts are distributed along 14 anticlines in an area 40 miles in width by 100 miles in length.

The gold-bearing districts are much less numerous and generally less productive in the western part of the field than in the east. This is chiefly due to the folding being more gentle and the domes broader, hence the slipping of the beds and fracturing has been less pronounced with the consequent failure to produce channels favourable for the circulation of solutions and the deposition of vein matter.

Quartz, with hardly an exception, forms by far the largest proportion of the vein filling, but occasionally inclusions of country rock or certain minerals are quite abundant. Associated with the quartz, the principal minerals are pyrite, arsenopyrite, calcite and galena, less frequently chalcopyrite, sphalerite, dolomite, chlorite and pyrrhotite, and more rarely scheelite, stibnite, feldspar, rutile and specular iron.

Silver is found in the gold recovered from cross-veins at Leipsigate, Brookfield and some other districts, sometimes in such amounts as to reduce the value of the product to $16 an ounce. But the gold produced from the interbedded veins is generally very fine and varies in value from $19 to $20 per ounce. The gold generally occurs free and visible and is amenable to amalgamation, but it is also in part intimately bound up with the sulphides, thus requiring other methods of treatment for its recovery. In the white, coarsely crystalline quartz it is found in coarse, visible particles, while in the bluish, oily quartz of the laminated veins it is usually disseminated more finely or is found in plates in the layers parallel to the walls. It is generally most abundant on the footwall, is very commonly associated with arsenopyrite, frequently in lenses or nodules forming large nuggets, and almost invariably with galena. Small crystals of gold are sometimes found in rhombic dodecahedra and octahedra, generally distorted, with bevelled edges and finely striated surfaces. Plates and scales are often found in the adjacent slate, but close examination always reveals the presence of minute films or threads of quartz traceable to the parent vein.

**Interbedded Veins.**—As has already been pointed out, the auriferous veins are found on domes, although in some few cases, as at the Richardson mine, they are found on the pitching parts of anticlines remote from domes. In such cases, however, conditions favourable for ore deposition have been brought about by a notable change in the angle of pitch, producing virtually a doming of the anticline that is not apparent at the surface.

The distribution of the veins on any particular dome is intimately related to the rock structure, and complexity is introduced by the unsymmetrical character of the domes. On sharp, closely folded anticlines, where the two limbs form an angle of less than 40 or fifty degrees, the veins are found close to the apex and curve over the anticline, forming a succession of superimposed saddles, similar to the "saddle-reefs" of Victoria, Australia. On broad folds, on the other hand, where the angle formed by the two limbs is over 45 degrees, the veins are found at a greater distance from the axis, but generally within the limit of curvature of the strata of the fold beyond which the dip ceases to increase and becomes uniform. If one end of a dome is flatter than the other, the veins at that end are further removed from the axis than at the other; and if veins occur on both limbs of a transversely unsymmetrical dome those on the limb with the higher angle of dip will be nearer the axis and more abundant than those on the limb with the lower dip. In many districts the veins are found on one limb only, and then they invariably occur on the limb with the higher dip, which is generally the south dip.

The interbedded veins have a more or less crescentic outcrop. On the sides of long domes, they form nearly straight lines, but finally curve with the strata around the apex of the fold, and some have been traced continuously around the end of the dome from one limb to the other. But generally the outcrops of veins form only small portions of elliptical curves, and these are most frequently arranged en echelon so that they lie in zones radiating from the centre of the dome and diverging more or less from the major axis according as the fold is broad or narrow. These zones are on those parts of the dome where the strata do not strike approximately parallel with the axis of the fold, but curve towards the axial line. In symmetrical domes, like that of Oldham, there may thus be four zones, and these four zones may be considered as merging into one another so as to favour the formation of veins, the outcrops of which form almost complete ellipses. In most districts, however, there are only two zones of veins, as at Waverley, where they may be regarded as merging into one to form saddles; and in some districts there is only one zone, as at South Uniacke.

*Extracts from article in Guide Book No. 1, published by the Geological Survey for the twelfth International Geological Congress, August, 1913.

Mining operations in several districts have shown that underlying the veins exposed at the surface are other parallel interbedded veins. Each district has thus a vein-bearing zone with a horizontal extent determined by the outcropping veins and with an indefinite vertical extent. In its vertical extension each zone is believed to be roughly parallel with the axial plane of the anticline. The distance of the exposed veins from the axis depends on the dip of the strata, and it is probable that the distance from the axial plane of any portion of the zone of veins extending into the earth is also dependent on the dip; if the fold gets sharper with depth, the zone of quartz veins probably approaches the axial plane, or if it flattens with depth, the zone of auriferous veins recedes from the axial plane.

**Corrugated Veins.**—Interstratified veins often exhibit a remarkable folded or corrugated structure within the beds of slate that contain them. The corrugations, or crenulations, usually occur at or near the apex of the anticline and sometimes in the syncline, and run parallel with one another and in a direction approximately parallel with the axis of the fold. At the apex of the fold the corrugations dip with the dip of the strata, which then corresponds to the pitch of the fold, but on each side of the apex they radiate more or less from the centre. The aptitude and interval of the folds generally vary with the thickness of the vein and of the enclosing bed of slate. Also the nearer the veins lie to the anticlinal axis the more pronounced these corrugations become. In some veins the folding has been so intense as to separate the quartz with disconnected rolled portions. The name "barrel" quartz has been given to the larger corrugations, because when such a corrugated deposit was first uncovered at Waverley, it looked to the miner like the back or top of barrels lying in rows.

Where one of the corrugations becomes enlarged or some part of a vein swells out and takes on some peculiar form extending for some distance in one direction, this portion of the veins is called a "roll." A roll is generally richer than other parts of the vein. Its position is usually dependent on some peculiarity of rock structure, such as some small subordinate crumple, some slight flexure in the beds indicating an incipient crumpling or some zone of fracturing. As such structures usually affect a great thickness of strata, a number of veins are affected by similar conditions and a roll in one vein is succeeded by similar rolls in the underlying or overlying veins. Series of such rolls are found in most districts and constitute one of the principal and more persistent forms of ore deposits.

**Thickness of Interbedded Veins.**—The thickness of the interbedded veins varies from a fraction of an inch to 20 feet (6 m.). The greater number may not be over an inch (25 cm.), but those that have been worked, generally vary from 3 to 18 inches (7 to 45 cm.). The largest veins are usually found on sharp anticlines in the shape of saddle veins. Saddle veins attain their maximum thickness at the apex of the fold and become thinner as they extend down on the limbs. Thus the Richardson saddle vein, while 20 feet (6 m.), thick at the apex thinned down to 6 feet (1.8 m.) at the 300-foot level. Some leads have been followed in depth several hundred feet with little or no decrease in size, but others have been found to pinch to a mere film and it is probable that nearly all of them pinch out at no great depth. The Dominion lead at Waverley was found to decrease from 15 inches (40 cm.) on the surface to a mere film of quartz with small lenticular pockets at 500 feet (150m.) and to be completely wanting at 600 feet (180m.).

Veins are frequently thickened by local disturbances, such as a bend, a crumple or a faulting of the strata.

Although leads show a great similarity and are very numerous, yet many of them possess a certain individuality, some peculiarity of colour, structure, lamination, distribution of sulphides, quantity or form of gold, serving to distinguish them from others of the same district.

**Cross or Fissure Veins.**—A few important veins cut across the strata for a considerable distance, and in some districts they form the principal auriferous deposits. These cross veins, often spoken of as fissures, sometimes curve and branch, contain inclusions of country rock, and have a gouge on the walls. All the most important are found on domes, generally cutting the main anticline at various angles. They occur chiefly in the Goldenville formation, but also in the Halifax formation, especially at the base. Seldom does a cross vein lie in the fault plane. In the case of the Cope lode of Central Rawdon and the Baker vein of Oldham, which are exceptions to this rule, the faults are probably younger than the veins.

The thickness of the cross veins is less regular than that of the interbedded veins, probably because they generally intersect alternating beds of different hardness. They do not attain great thickness, except sometimes at their intersection with interstratified leads, flexures or rolls. The mineral content is generally the same as that of the interbedded veins, but the laminated structure is wanting. In many cases the value of the gold extracted is much reduced by the presence of silver. At West Gore enough stibnite was found to form gold-antimony ore deposits of considerable value and extent.

**Bull Veins.**—There is another kind of vein differing from those already described. It may cross the strata or roughly lie in a stratification plane. It shows little or no trace of lamination, carries few metallic minerals and is composed of white crystalline quartz in which geodes with quartz crystals are sometimes found. These veins are usually thicker than the others, varying from one to several feet. They are not auriferous and are known as bull veins.

**Angulars**—Many of the main veins have branches passing into the foot or hanging wall. These branches are termed angular, and they play an important part in the ore deposition in certain veins. The point from which an angular passes from the main vein into the hanging wall is usually higher than that from which it passes into the foot wall, and the intervening portion of the vein is frequently thicker and richer than other portions. Their distribution and attitude are dependent on the structure of the dome. In some parts of a dome they may be numerous or completely absent; they may have a general strike and dip quite different from what is found in another part of the dome. In crossing the bedding, they generallly run nearly perpendicularly to the quartzite, but obliquely through the slate. In a closely folded anticline they are more numerous at or near the apex, where they often form a reticulated system of veins extending along the axial plane from one lode to an overlying or underlying one.

The quartz of the angulars differs from that of the main veins in being of a fine, granular texture, free from laminations.

(To be continued.)

# JEFFREY SHORTWALL MINING MACHINE

The principal parts of this machine may be grouped as follows: Motor, reserve switch, starting box, gearing, friction disc clutch, feed drum, retarding drum, cutter bar, truck and electric cable reel. All of these, with the exception of the truck and cable reel are insulated from the box and operating handle. The reverse switch (as the name implies), is used for obtaining two directions of rotation of the motor, for cutting in either direction and for operating the self-propelling truck.

The driving mechanism of the truck is supported by a bearing mounted on the rear of the truck and known as the sprocket and worm shaft bearing. It consists

**Figure 1. Illustrating the method in which the machine enters the room on its own truck**

mounted on a cast steel frame, known as the bed frame. The motor is mounted on the rear of the bed frame and is of the consequent pole type, having two series and two shunt coils. The armature is of the drum wound type and is mounted in a horizontal position. The motor is built either open or enclosed, and all of the late type are equipped with ball bearings on the armature shaft. The reverse switch is entirely enclosed. It consists of four stationary contacts mounted on a slate base and two movable contacts mounted on a heavy moulded insulation centre. All "live" parts are well

of two shafts, one in line with the armature shaft, and on which is mounted a clutch and worm. The other shaft is at right angles to this and on it is mounted a worm wheel and 6 tooth drive sprocket. The worm wheel is keyed to a sleeve mounted loose on the sprocket shaft and is driven by the worm mentioned above. The worm wheel also forms a housing for the friction disc clutch, which drives the sprocket shaft. The speed of the truck may be varied from 0 to 350 feet per minute and is regulated by the pressure applied on the discs. Trucks of former design were equipped with a jaw

**Figure 2. Illustrating method of sumping**

clutch in place of a friction disc clutch. The 6 tooth drive sprocket is connected by No. 152 steel roller chain making all four wheels drivers. A bank brake is used for stopping the truck, or controlling the speed on grades. It is operated by the same lever used for the friction disc clutch. With one movement of the lever the pressure is released from the discs and applied to the brake.

The machine is brought into the room on its own truck as is illustrated in Fig. 1.

The machine is unloaded by releasing the pin clutch on the truck which connects with the clutch on the end of the armature shaft, raising the jack arm (beneath the starting box), starting the motor and throwing the shifting lever to the right. This operation causes the clutch to engage with the clutch gear and gives the fast speed which is used for handling the machine.

Where the props are set close to the face, it is necessary to move the machine to the face before moving to the rib, using the idler sheave wheel hooked in the cutter bar in order to move the machine in limited space. The angle at which the machine is placed for making the sumping cut depends almost entirely upon the nature of the coal to be cut and the condition in which it is necessary to leave the rib. Under ordinary circumstances, the machine is placed at an angle of 30 degrees to the right hand rib, although in some places it may be placed at an equal distance between the face and rib.

The sumping cut is made by turning the eccentric to engage the pin clutch with the chain sprocket, and then starting the motor. The clutch shifting lever is then thrown to the left—this causes the clutch to engage with the clutch pinion and gives the slow speed which is used for cutting. As the cutter bar advances into coal, the machine will slowly swing toward the right hand rib. In some cases, however, this movement is so rapid that it is necessary to use the rope from the rear drum to retard the rear of the machine.

After the sumping cut is completed, preparations are made for cutting across the face. The feed rope is unwound from the drum and carried across to the left hand rib, where it is fastened to the bottom plate of a jack placed about 18 inches from the face of the coal. The retarding rope is fastened to the jack which was used for the feed rope while sumping.

In cutting across the face, the slow speed is used, which, as explained heretofore, is obtained by throwing the clutch shifting lever to the left. The retarding rope, which is controlled by the steed band on the drum, is used to hold the machine at the proper angle to the face.

# DESULPHURIZING SILVER ORES AT COBALT

Mr. James J. Denny, writing in the Mining and Scientific Press, gives the following account of the process of desulphurizing silver ores as worked out by him and now in use at the Nipissing low-grade mill. "In the fall of 1911 I undertook a series of experiments in connection with the projected Nipissing low-grade mill to test the possibilities of several proposed methods of treatment and to discover, if possible, an all-cyanidation process that would improve on the general practice.

"After a considerable amount of experimenting I found that my results varied greatly, and to determine the cause I ran separate tests on the principal silver-bearing veins. My experiments showed that while some veins gave excellent results by ordinary cyanidation methods, the tailing from the treatment of other veins was persistently high, owing to the presence of varying amounts of the complex minerals, pyrargyrite, tetrahedrite, pronstite, dyscrasite, and argentite. Some of the veins on the Nipissing property contain considerable amounts of these minerals, and my experiments were therefore directed to discover some inexpensive chemical or electrical process for breaking up these refractory compounds and so rendering them amenable to cyanidation. Working along these lines, I finally discovered that all of these minerals excepting dyscrasite were readily decomposed into their respective elements when brought into direct contact with aluminum in an alkaline solution. This preliminary reducing treatment left the silver in a spongy metallic state and when followed by the usual cyanidation process the results were found to be very satisfactory.

"By the preliminary treatment the silver, and in part at least, the antimony and arsenic, are reduced to the metallic state, and are so found. The reduction is accomplished by the nascent hydrogen resulting from the action of caustic soda on the aluminum according to the following equation:

(1) $2Al+2NaOH+2H_2O=Na_2Al_2O_4+6H.$

The probable reactions involved in complete reduction are indicated by the following equations:

(2) Argentite.

$$6H + 3Ag_2S + 6NaOH = 3Na_2S + 6H_2O + 6Ag$$

(3) Pyrargyrite.

$$6H+Ag_3SbS_3+6NaOH=3Na_2S+6H_2O+3Ag+Sb$$

(4) Proustite.

$$6H+Ag_3AsS_3+6NaOH=3Na_2S+6H_2O+3Ag+As.$$

The reactions being reversible, probably the arsenic and antimony are not completely reduced to the metallic state in practice, and the investigation of the subject is rendered difficult by reason of secondary reactions by which the arsenic and antimony are possibly redissolved to form arsenates and antimonates by the excess caustic of the reducing solution, and the protective alkili of the cyaniding solution. The working solution shows the presence of these compounds, "but in practice they are found to have no detrimental effect either in the reducing or the cyaniding treatments. The solution assays, antimony 0.0084% and arsenic 0.026 per cent.

"I then undertook a large number of tests on a commercial scale, using ordinary run-of-mine ore to determine the following points: (a) the effect of the reducing treatment; (b) the time of treatment; (c) the degree of comminution required to give the best economic results.

"These results show clearly that on the run-of-mine ore the desulphurizing treatment raises the extraction appreciably and greatly reduces time. These and similar experiments establish the efficacy of the desulphurizing process and point to 48 hours as the most economic time of treatment.

"It was early apparent in this preliminary investigation that extremely fine grinding was absolutely essential to give a high extraction in the desired time (48 hours), and this fact has been substantiated by many later experiments.

"The method of treatment as outlined above was immediately put into practice at the Nipissing low-grade mill on the recommendation of Charles Butters, the consulting engineer."

# THE DISASTROUS EXPLOSION AT THE UNIVERSAL COLLIERY (SOUTH WALES)*

So terrible is the disaster at the Universal Colliery, which lies near a tributary of the Rhymney, amongst the barren hills of East Glamorganshire, that the whole industry must be reduced to a numbed silence. The immensity of this calamity—the greatest, numerically, that has ever visited the British coalfields—coming at a time when science has half promised us that to-morrow shall see the end of all colliery explosions, stuns and bewilders. Pity and grief for the time must be supreme; but the energy and heroism of the rescuers, some of the best stuff that Wales possesses, give the first trumpet call to renew the battle, and, whatever errors may lie hidden for the present with the dead men behind the wall of fire at Senghenydd, we can at least hope that they may direct us nearer the truth, and so be the means of saving generations of pitmen yet to come.

Below is given a list of the most serious explosions that have occurred in British Collieries since 1851:

| Mine. Date of Explosion. | No. of Deaths. |
|---|---|
| Ince Hall, Lancashire, Feb. 18, 1854 | 89 |
| Cymmer, South Wales, July 15, 1856 | 114 |
| Lund Hill, Yorkshire, Feb. 19, 1857 | 189 |
| Burradon, Northumberland, March 2, 1860 | 76 |
| Risca, South Wales, Dec. 1, 1860 | 142 |
| Oaks, Yorkshire, Dec. 12, 1866 | 361 |
| Talk-o'-the-Hill, Staffordshire, Dec. 13, 1866 | 91 |
| Ferndale, South Wales, Nov. 8, 1867 | 178 |
| Moss Pit, Lancashire, Sept. 6, 1871 | 70 |
| Swaithe Main, Yorkshire, Dec. 6, 1875 | 143 |
| Blantyre, Lanarkshire, Oct. 22, 1877 | 207 |
| Haywood Wood, Lancashire, June 7, 1878 | 189 |
| Abercarn, South Wales, Sept. 11, 1878 | 268 |
| Risca, South Wales, July 15, 1880 | 120 |
| Seaham, Durham, Sept. 8, 1880 | 164 |
| Naval, South Wales, Dec. 10, 1880 | 101 |
| Trimdon Grange, Durham, Feb. 16, 1882 | 74 |
| Clifton Hall, Lancashire, June 18, 1885 | 178 |
| Mardy, South Wales, Dec. 23, 1885 | 81 |
| Udston, Lanarkshire, May 28, 1887 | 73 |
| Llanerch, South Wales, Feb. 6, 1890 | 176 |
| Morfa, South Wales, March 10, 1890 | 87 |
| Park Slip, South Wales, Aug. 26, 1892 | 112 |
| Thornhill, Yorkshire, July 4, 1893 | 139 |
| Albion, South Wales, June 23, 1894 | 290 |
| Universal, South Wales, May 24, 1901 | 81 |
| National, South Wales, July 11, 1905 | 119 |
| Maypole, Lancashire, Aug. 18, 1908 | 75 |
| West Stanley, Durham, Feb. 17, 1909 | 167 |
| Whitehaven, Cumberland, May 11, 1910 | 136 |
| Hulton, Lancashire, Dec. 21, 1910 | 344 |
| Cadeby, Yorkshire, July 9, 1912 | 87 |
| Universal, South Wales, Oct. 14, 1913 | 427 |

It will be seen that this ill-fated colliery has already been the scene of a disastrous explosion, which occurred in the early morning of May 24, 1901. That explosion was even more violent than the last, practically every part of the workings being penetrated, and 81 of the 82 men at work in the pit at the time were killed. In the light of after events it is a notable fact that Prof. William Galloway, who made a report following the explosion, urged that it was a conspicuous example of a coaldust explosion. He says:

"The intake airways contained pure air and inflammable coaldust, but no firedamp; the return airways contained air mixed with all the firedamp produced in the workings, and uninflammable stonedust, but no coaldust; and as the return airways, speaking generally, were untouched by the explosion, the conclusion that the coaldust when mixed with air played the part of an inflammable quasi-gas in the explosion seems to be irrefragible."

He added: "It is evident that an explosion of coaldust in a confined space like the workings of a mine is of a totally different nature from the conceptions of it that have been published from time to time both in this country and on the Continent."

Prof. Galloway considered that the explosion was due to a shot igniting coaldust, but no very positive evidence was available. At the same time he pointed to the dry and dusty condition of the mine, and particularly called attention to the faulty construction of the trams. The jury added a rider to their verdict asking that Parliament should make watering compulsory in all mines of this character.

Read now, after the lapse of 12 years, these quotations from Prof. Galloway's report give food for thought. Have we travelled very far in that time? It is a question which we scarcely care to answer. The original cause of Tuesday's explosion cannot yet be even surmised, but there is abundant evidence that, if coaldust was not ignited in the first instance, it was largely responsible for the propagation. The course of the explosion wave against the current is a familiar phenomenon of coaldust explosions, and the impressions of survivors within the area are consistent with the supposition. Why the force of the explosion emerged with such violence up the downcast instead of traversing the eastern workings has yet to be explained; it may have been due to the condition of the roadways, or again to some of those divergent forces which have been studied so carefully by the French investigators. This divagation of the explosive wave to the upper air, at any rate, probably saved the lives of half the men in the pit.

It has never been the policy of the Colliery Guardian to hazard reckless opinions as to the cause or incidents of an explosion upon the morrow of its occurrence. Such speculations should always be left until the facts are ascertained. There are many points upon which it will be of great interest to have information in the present case—such as the steps that had been taken at this colliery to prevent or mitigate explosions and their efficacy in the light of actual experience; the utility of the breathing appliances employed in the work of recovery; the bearing of the accident upon such latter-day questions as the reversal of the air current, the construction of stoppings, etc. It seems probable that the condition of the mine may afford valuable evidence on all these subjects, to the ultimate advantage of all those whose livelihood is bound up with the getting of coal.

We cannot pass from this phase of the Universal explosion without remarking that once again the upholders of the high-barometer theory are claiming its substantiation. On this occasion they are guilty of a definite misstatement of fact. Any of our readers who care to examine the weather charts for the past week will see that for some time prior to Tuesday a low-pressure system was advancing from Iceland towards these islands after a period of tolerably high barometer. To say, as does the Morning Post, that "at the time of the explosion the barometer was declining

*From the Colliery Guardian.

slowly at the scene of the accident, but it was still as high as 30¼in. over the estuary of the Severn, a height considerably above the normal for the district," is directly to ignore the fact, well known to mariners and others for whom the barometer is more than a toy, that it is not the height but the tendency of the mercury column that matters. Of course, we do not go to the extremes of our contemporary and conclude summarily that this falling glass in itself was the cause of the Senghenydd explosion, but possibly it formed a link in a chain of coincidences.

It may at once be stated that, in this case, shot-firing can be removed from the list of suspects, as blasting was only carried out at week-ends. The explosion appears to have been strictly limited in its effect, so that had it not been for the outbreak of fire before the rescue parties could reach the working faces, it is probable that accurate data would even now be in the possession of the experts. This malignant fire seems to have selected a site of all the most unfortunate, effectually barring entrance to a wide network of workings beyond; it does appear, indeed, that after we arrive at the point when it is possible to control the dynamic consequences of an explosion, we have still an even more potent enemy in fire. In every disaster of recent years—Whitehaven, Hulton, Cadeby Main and Cadder—the fire element has been predominant. This seems to indicate the absolute necessity of preventing the initial ignition, instead of setting dubious traps to ensnare the explosive wave after it has started on its errand of death. Further, it is becoming increasingly obvious that if the trained rescue brigade is to fulfil its natural function, it must be better equipped for dealing with the fire peril. In this way, experience is once more bringing us back to original intentions.

# THE MINE SURVEYOR*

By Alex. Richardson, M. Inst. M. M.

Mine surveying is to-day recognized throughout the Union as a distinct profession. This recognition is partly due to the increased responsibility attaching to the work through the magnitude and systematic organization of modern mining operations, but mainly owing to its being necessary for mine plans to be signed by a certificated mine surveyor before the Government will officially accept them. Now every profession has its own characteristic scope, and calls for special skill in certain directions; and it is therefore desirable that anyone who aims at becoming a surveyor should devote particular attention to those lines of study which have a direct bearing on his work. With the object of assisting students of surveying, or those just beginning as assistants on the mines, to form an idea of the knowledge that will be required of them, I have drawn up a concise syllabus embracing those subjects which experience has shown me require closer attention than others.

**Arithmetic.**—Addition, subtraction, multiplication, and division; their tabulation, short cuts, abridged methods and checks. Greatest common measure. Least common multiple. Fractions. Decimals; rough tests for checking the position of the decimal point. Alligation. Square and cube measure. Ratio, proportion, and rule of three. Application of the terms average and per cent. Square root. Calculation of numerical values from simple formulae. Weights and measures.

**Algebra.**—Addition, subtraction, multiplication, and division. Brackets. Fractions, Factorisations, Indices. Transformation and simplication of formulae. Simple, simultaneous, and quadratic equations.

**Geometry and Mensuration.**—The theorems, problems, and corollaries of Euclid, books 1 to 4, 6 and 11, but not with strict adherence to the Euclidian order and method. Scales. Drawing to scale. Problems relating to lines, circles and plane figures. Location by rectangular co-ordinates. Projection of points and lines. Projection of plane figures on inclined planes. Line plane and plane. Areas of plane figures with rectilinear and curvilinear boundaries. Areas of surface of solids. Volumes of regular solids. Volumes of excavations, embankments and irregular solids. Density and relative density. Capacities and weights of structures. Use of planimeter. Measurement of quantities from plans. Measuring quantities and extending in schedule form.

**Trigonometry.**—Measurement of angles. Trigonometrical ratios. Application of algebraical signs. Trigonometrical ratios of two angles. Formulae for the division of angles. Relation between the sides of a triangle and the trigonometrical functions of the angles. Transformation and reduction of trigonometrical expressions. Logarithms. Mathematical tables. Properties of triangles. Solution of triangles. Measurement of heights and distances.

**Geology and Mineralogy.**—The external and internal forces effecting changes in the earth's crust, and the processes of disintegration, transportation, and deposition. Laws of stratification. Subsequent features; jointing, inclination, folding, and faulting. Sedimentary, metamorphic and igneous rocks; their formation, characters, and modes of occurrence. The simpler forms of ore deposits. Common rock-forming minerals. Methods of determining the strike and dip of strata, faults, dikes, and veins. Dip and strike problems. Faults and fault problems. Methods of physical and chemical examination by which minerals and rocks can best be identified in the field and in the laboratory. Geological sketch mapping and section drawing. Preparation of geological reports.

## MINE VALUATION.

Careful and systematic methods of sampling, booking, and preparing the sample for assay. Correct sampling procedure to adopt in difficult or unusual cases. Preparation of well arranged written or graphic records for easy reference. Right and wrong ways of averaging, and a clear understanding of the principles involved. Calculation of stoping and milling widths, tonnages, and values, of the ore reserves of a mine. Incidence of stoping width and sorting on the yield, working cost, and profit.

## SURVEYING.

Use of the steel tape in ordinary and precise work. The transit theodolite, its types, construction, adjustment, care, and use. Field books and methods of book

*From Presidential address, Chemical Metallurgical and Mining Society of South Africa.

ing. Sources of error. Prevention and elimination of error, instrumental or otherwise. Degree of accuracy required in different classes of work, and the simplest ways of obtaining it. Co-ordinates, their calculation and application. Problems and exercises in the use of co-ordinates. Traversing with the theodolite. Minor triangulation. Connecting surface and underground. Dumpy and wye levels, their construction, adjustment, care, and use. Levelling. Tacheometric surveying and levelling. Setting out above and below ground. Contouring. Sketching. Overcoming obstacles inseparable from underground surveying. Development and stope measurement. Concise methods of south African survey practice. Inclusive checks for the detection of error in instrumental, booking, calculating, and plotting work. Lettering, and general draughtsmanship. Enlarging and reducing plans, tracing, and blue printing. Supreme importance of accuracy in all departments of survey work.

### MISCELLANEOUS.

Manipulation of calculating machines. Methods of statistical presentation. Sufficient knowledge of structural design for the preparation of plans, specifications, and quantities relating to the simpler forms of foundations, dams, buildings, etc. Use of technical books and periodicals. Collection of significent data, and the compilation of reports. Ordinary mining methods and mining routine.

You will notice that, in the foregoing syllabus, I have made mention of several elementary divisions to which reference might seem to be more fittingly made in the prospectus of a preparatory school. I have included them because I wish to draw attention to the desirability of acquiring a more specialized knowledge of such simple processes than the average school or college course enables one to obtain. It is not common, for instance, to find, outside of financial circles, men who can cast long columns of figures with accuracy and despatch, or who are acquainted with the many time-saving arithmetical devices of the expert computer; and the mine surveyor will find that familiarity with such matters will ease his work considerably. Several things, such as the determination of azimuth from the sun or stars, the microscopical identification of rocks from thin sections, etc., I have omitted from my list because they come outside his ordinary work; but at the same time, he will be all the better equipped for any emergency if he knows how to carry them out.

Having now dealt with the training of the mine surveyor, I shall, following the practice of historians, skip a few uneventful years, and take up his work at a point where, after obtaining his certificate, he has been appointed to a producing mine of moderate size. On entering on his duties, his first care will be to ascertain what plans are in existence, and if they have been prepared in accordance with the government regulations, and that sufficient essential data exist to enable him to carry on and bring them up to date. Should the plans be much in arrear, he will proceed with the underground survey first; but before doing so he will assure himself that the instruments with which he is to work are in proper order and adjustment. In carrying out this extension of the underground survey, he will on each level begin several stations in from the last available one, and so, by overlapping, check the work of his predecessor at several points. While this work is proceeding, he will attend to any matters of urgency that crop up, such as giving lines for developers to work to, measuring up contract work, and so forth. The surface plan will then engage his attention, and, in addition to surveying in recent additional works, he may have occasion to check the position of some of the beacons by means of minor triangulation. At all times and seasons, his services will be in danger of being requisitioned by the engineer, to mark out sites, give centre lines and levels for construction work, measure up contract masonry and earthwork, and, generally, to attend to various matters appertaining to the office of clerk of works. He will also peg out and give levels for some tennis courts, and find out how few laps to the mile the sports ground will conveniently accommodate. The plotting of additional survey and geological data will always be in progress, as will also be the recording of development values and general mine sampling results. Special plans will have to be prepared from time to time for the Mines Department, consulting engineer, municipality, insurance company, and others. He will also be expected to make a thorough study of the faults and dikes in the mine, in order that he may assist the manager in correlating them, determining their course, and in forecasting the conditions likely to obtain in the lower levels, so that development may be planned out without incurring the risk of disagreeable surprises. The measuring of contract stope and development faces will necessitate the expenditure of much pedestrian energy, and require close application at the end of the month; and in the pursuance of this arduous duty something will be learnt of the value of tact and patience as neutralizers of acerbity. Once every year, at least, the ore reserves of the mine will have to be recalculated, and this work will call for considerable judgment in determining which blocks may be legitimately classed as developed, the stoping widths likely to be obtained in breaking the ground, the best way of arriving at the value of those blocks whose peripheries have been irregularly or incompletely sampled, and in estimating the value of many other factors not amenable to rule. He will, if ambitious, keep the mine manager's certificate and the mine manager's position in view, and endeavour, by taking an active interest, if possible participation, in every phase of underground work; with a studious regard for the surface departments, to qualify himself for taking control of the mine should it ever become his privilege to do so.

## LABOUR AND CAPITAL

It is very much the fashion nowadays, even with those of otherwise sane judgment, to speak of capital invariably as the villain of the piece and labour as the long suffering, exploited hero. There is as little common sense in this attitude of mind as there would be in considering the right hand and the left as irreconcilable enemies. In fact, each is indispensable to each, and harm to the one inevitably reacts on the other. In the history of capital there are many dark pages; but will any fair-minded judge affirm that the book of labour is unstained? Long ago it has passed into an axiom among captains of industry that high wages, good conditions, security of employment, and shorter hours are a sine qua non of the best production. As civilization progresses these things grow increasingly evident, and only doctrinaires, fanatics, and self-seeking demagogues will deny them. But all this, like all natural processes, is slow in growth, and your enthusiast, who would build Rome in a day, cannot wait for its realization. He is impatient for the millennium and cares not greatly through what disasters he travels to attain it. After all, it is his dupes who suffer when they discover that the earthly paradise has a disturbing affinity with the poorhouse.

# THE NANAIMO STRIKE

The Daily Colonist, Victoria, publishes the following account of the sentencing of men found guilty of rioting in connection with the U. M. W. A. strike on Vancouver Island:—

In passing sentences, His Honour said: "It is the custom when sentences are given that the judge make but little comment thereon, but in this case I am going to depart from the usual custom, for these cases are out of the ordinary, and call for a few remarks from me. Let me say to you men, before going any further, that you have been well defended, and this has been shown not only in the handling of your cases, but in the selection of those of you who pleaded guilty or not guilty. Your counsel has said all that could be said, and if I have found you guilty it is not because your counsel has erred, but because you have woven around you a net of circumstances beyond the power of any counsel to untangle.

"This was not an ordinary riot. It was not a sudden ebullition of pent-up feeling, but it shows all down the line a deliberate scheme, a design from one end to the other. The riots at Nanaimo, South Wellington, Extension and Ladysmith were all for one purpose, were simultaneous and carried out with one line of action. Bombs were thrown, property destroyed and peaceful citizens made to flee for their lives, and a persistent state of terrorism indulged in. After the bomb-throwing at the Temperance Hotel, parades were formed, evidently for the purpose of showing your numerical strength, and that you were in charge of the situation.

"After this, mobs ran at large all over the city, picking out various houses and stoning them. Then, later on, another mob or two went around on what they termed a 'peace mission,' but which really meant that a band of lawless citizens went around ordering peaceful citizens out of town at the risk of their lives. And these people had a right to work as you had. Anything less than this is mob rule.

"Your counsel has made to me various pleas. He has told me that many of you pleaded guilty, and that this is a factor which must be taken in consideration. I have looked over your faces to see if I could see any sign of sorrow or repentance for what you have done, but I fail to find one man among you to express sorrow for his lawless act.

"Your counsel knows there is no more sympathetic man than myself, one ever ready to extend mercy, but I have read over all the depositions and find but little mercy you have shown. I read where homes in which there was sickness were not free from missiles which you threw, and little children hid in cupboards and under beds to escape rocks thrown upon them in merciless fusilade. The only time any mercy was shown was when one of you said: 'Don't throw a rock at that house; there is measles there,' and when the cowardly bombs were thrown at the Temperance Hotel and at the home of Alex. McKinnon, the only mercy shown was the mercy of God.

"I was appealed to on behalf of your wives and children, but what do I find here? I find your women singing, 'Drive the scabs away,' and throwing rocks themselves, and these actions take away very much of the strength of the appeal for mercy on your behalf because of your women. The evidence shows not only a riot here, but that a far more serious charge might have been laid against you.

"I recognize I have a duty to perform, painful in the extreme, but the law-abiding people in this community must be protected and punishment meted out, so that there may be no further occurrence of these lawless riots.

"I have arranged you into three lists according to your degree of guilt.

"In the first list are Paul Deconich, Samuel Guthrie, John Morgan, William Simpson, jr., and Joshua John Taylor. The maximum penalty for rioting is two years. I have gone down the line, through the depositions, and find Guthrie and Taylor to be the leaders, to be fomentors and not peacemakers, in a determination to carry out an illegal purpose. Deconich, Morgan and Simpson, while not leaders in the rioting, the evidence showed you in this thing from beginning to end, and I see no reason why I should give you any clemency on account of your age, and I will therefore sentence you all five to a term of two years in the penitentiary, the sentences to date from now.

"In the second list I have placed John Ollsopp, jr., J. H. Armstrong, Charles Axelson, William Bauld, George Bombero, Sam Brightman, James Colley, Robert Cossar, Peter Galuska, H. H. Langdon, Duncan McKenzie, John McKenzie, Joseph Mairs, jr., James Marshall, Charles Mortimer, Steve Mrus, Steve Puyanich, George Portray, William Stackhouse, Martin Slogar, James Wallace, Robert Walkinshaw and Charles Yoga. I do not find you men as deeply involved as the ringleaders, but you were engaged in the work of destruction, and the sentence of the court is one year's imprisonment and a fine of $100, or, in default, four months.

"In the third list are Henry Dyer, John Fisher, Ernest James, Alvar Kotilla, Richard Morgan, sr., William Paterson, William Sterling, John Scott, Henry Taylor, Richard Whisker, and Edward Williams. I find you men not to be involved very deeply, and the sentence of the court is three months in jail and a fine of $50, or, in default, two months.

"Dyer, you were shown to be badly mixed up in this affair, but you were the only one who told me the truth when I asked for a statement from the accused, and when the work of destruction was going on, you were the only one who had any sympathy in your heart for the victims of the mob's vengeance."

Mr. Leighton, counsel for the prisoners, submitted that His Honour should consider the length of time the men had already served, and make the sentences date from the day of arrest, which request His Honour granted.

Concluding his remarks, Judge Howay said: "In conclusion, I want to say this is the most painful matter I have ever undertaken, and if I were to consider my own feelings this is the last thing I would wish to do. But in my position I must recognize the community as a whole, and I feel, and I believe, the public will feel, that I have exercised an extremely fair tempering of justice with mercy. I wish to thank the officers of the militia and the court officials for their kindness and services during the progress of these trials."

The court thereupon adjourned.

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The satisfaction which all law-abiding citizens must feel at the vindication of law and justice and at the dignified and merciful manner with which they have been administered in the case of the Nanaimo strikers, is tempered with a feeling of regret, amounting to sadness, that so many men habitually peaceable and law-abiding, who under ordinary circumstances could not be induced to overstep the bounds of reason and moderation, should have been brought within the clutches of the law. There is little satisfaction at any time in meting out punishment to men who are not habitually criminal and while there may have been no alterative in the present case, there is no doubt that Judge Howay spoke truly when he said that he had never been called upon to perform a more painful duty. The feeling of sadness is deepened when one reflects on the occupation of these men, an occupation at all times hazardous, the only occupation which deprives its followers of at least eight hours daylight every day and compels them to toil in Cimmerian darkness. Not only are miners at the mercy of the natural elements and natural laws, but they are only too often the victims of the oversight and carelessness of officials or of their fellow workmen.

There is no class of workers in the world which has so seized upon the popular imagination, which has so aroused popular sympathy, or which has written its history more indelibly on the pages of industrial records by deeds of valour unexcelled on the battle-field. Then perhaps, there is the last consideration that these men are engaged in a perilous calling in order that their more fortunate fellows, whose occupation is both lighter and pleasanter, may be furnished with one of the prime necessaries of life. That half a hundred of such men should have to be punished by terms of imprisonment because in a mad moment they followed the advice of unscrupulous leaders must ever be a matter for regret.

Now that the law has had its "pound of flesh" and bitterness has been brought into many a home, it is surely time to consider whether some means cannot be devised for preventing the recurrence of what is nothing short of a social calamity. It is true that the remedy rests to a large extent in the hands of the miners themselves. No plea can justify acts of violence, but there were many circumstances which tended to provoke the recent uprising and which without mitigating its illegality render the consequences less worthy of censure than if there had been no provocation. All men have to suffer for their own ignorance and folly and coal miners cannot be exempt from this natural law. They cannot be compelled to choose wise counsellors and honest leaders, but if it be possible to devise any means, legislative or otherwise, to limit the possibilities of such unscrupulous leadership as has brought the Nanaimo strikers to the recent pass, it should be done without delay. The miners are not so ignorant that they cannot learn a lesson. It may have to be knocked into them by many hard blows, of which the Nanaimo strike is one of the hardest on record, but now that is a thing of the past there is room for mediation and conciliation, not of the stereotyped class, but of the kind which honestly seeks to help those who cannot help themselves and who at ordinary times are amenable to reason. The Week puts forward a plea for more sympathetic consideration of the coal miners' claims without for one moment receding from the position it has always taken in condemnation of their excesses during the recent strike. It goes further, and urges that such an attitude is necessary if the future of coal mining on Vancouver Island is to be peaceable and profitable.—The Week, Victoria, B.C.

## IRON IN 1913

The American Iron & Steel Association reports that the production of pig iron in Canada in the first six months of 1913, including ferrosilicon and ferrophosphorus, amounted to 545,981 gross tons. The output in the whole of 1912 was 912,787 tons. The production of pig iron in the two halves of 1912 is not available. Of the total in the first six months, 532,431 tons were made with coke and 13,550 tons with charcoal, coke and electricity, etc. The production of basic pig iron in Canada in the first half of 1913 amounted to 292,625 tons, bessemer pig iron to 125,052 tons, and foundry pig iron, ferrosilicon, ferrophosphorus, etc., to 128,304 tons. Forge pig iron was not reported. Of the 545,981 tons of pig iron produced, 345,810 tons were delivered to mixers, openhearth furnaces, etc., in a molten condition, 141,680 tons were sand cast, and 58,491 tons were machine cast.

On June 30, 1913, Canada had 20 completed blast furnaces, of which 13 were in blast and seven were idle. Of the total 16 furnaces usually use coke for fuel and four use charcoal. In the first half of 1913 two plants made ferrosilicon and ferrophosphorus in electric furnaces. During the first six months of 1913 the number of furnaces actually in blast during a part or the whole of the period was 15, of which 14 used coke for fuel and one used charcoal. The average number of days the 15 furnaces ran was 167.6, which would give an average make per furnace day of 217 tons.

One entirely new furnace was completed in Canada during the first six months of 1913, No. 7 coke furnace of the Dominion Iron & Steel Co., at Sydney, Cape Breton, Nova Scotia, which was first blown in on May 22. It has an annual capacity of 91,250 tons of basic pig iron.

Two blast furnaces were being built in the Dominion on June 30. One of these furnaces will be operated by the Canadian Furnace Co., Ltd., at Port Colborne, Ont. When completed it will be 85 x 19½ ft. and will have an annual capacity of about 125,000 gross tons of bessemer, foundry and malleable pig iron. Lake Superior ore and Connellsville coke will be used. It is almost ready to blow in. The other furnace is being built at Parry Sound, Ont., by the Standard Iron Co., Ltd., of Montreal. When completed it will be 60 x 12 ft. and will have an annual capacity of about 36,000 gross tons. Charcoal will be used for fuel. Hematite and magnetite ores from Michigan and Ontario will be used. The Standard Iron Co. also operates a charcoal furnace at Deseronto, in Ontario. The annual capacity of the 20 completed blast furnaces on June 30, 1913, was 1,391,550 gross tons, and of the two building furnaces 161,000 tons, a total of 1,552,550 tons.

## MEETING OF TORONTO BRANCH, CANADIAN MINING INSTITUTE.

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club on Saturday, Nov. 8. The reports of Chairman Jas. McEvoy and Secretary A. G. Burrows were presented. A. M. Hay was chosen chairman for the ensuing year and R. E. Hore secretary. The executive committee is composed of D. A. Dunlap, G. C. Bateman, C. E. Smith, W. F. Ferrier, A. J. Young, J. M. Clark, W. G. Miller, J. C. Murray and H. E. T. Haultain.

The chief topic discussed was that of securing permanent headquarters for the Institute. It was announced that friends are willing to make liberal donations for the purpose.

# PERSONAL AND GENERAL

Dr. F. H. Hatch has been elected President of the Institution of Mining and Metallurgy for the forthcoming year.

Mr. Geo. Watkin Evans, consulting coal mining engineer of Seattle, has completed the examination of the Matanuska coal field of Alaska for the United States navy. Mr. Evans will soon resume his private practice in Seattle.

Mr. Julius M. Cohen has resigned his position with Graphite, Limited, St. Remi d'Amherst, Que., to accept the position of assistant manager with the Porcupine Crown Mines, Limited, Porcupine, Ont.

Mr. W. F. Battersby has been appointed mill superintendent at the Dome, South Porcupine, succeeding Mr. Languth, who is giving all his time to the construction work in connection with the additions being made to the present mill.

The Western Mining Directory Company, Denver, Col., is preparing a 1914 edition of the International Mining Manual.

Mr. Jas. Ashworth addressed the Vancouver, B.C., Chamber of Mines on November 3 on "Notes on the Coalfields of the Coast Inspection District of British Columbia."

Mr. T. Walter Beam has returned to Denver, Colorado, U.S.A., after having spent the summer and autumn in Camp Hedley, in charge of the diamond drill operations of the New York Syndicate No. 2, which has under option of purchase a group of mineral claims in the vicinity of Hedley, Similkameen, B.C.

Mr. Melbourne Bailey, of Barkerville, B.C., manager of the John Hopp hydraulic placer-gold mines in Cariboo district, was in Victoria for several days in October, where he was a witness in a water-record dispute case that was before the Supreme Court.

Mr. Chas. F. Caldwell, managing director of the Utica Mining Co., of Kaslo, B.C., was in Winnipeg, Manitoba, last month, in connection with transportation difficulties during the reconstruction by the Canadian Pacific Railway Co. of the Kaslo & Slocan Railway, upon which the Utica mine depends for transportation facilities.

Mr. W. A. Carlyle has gone to South Africa.

Mr. Patrick Clark, of Spokane, Washington, U.S.A., who holds a comparatively small proportion of the shares in the Standard Silver-Lead Mining Co., was at the company's mine and concentrating mill, near Slocan Lake, B.C., last month.

Mr. E. J. Conway is in charge of the camp the Granby Consolidated M., S. & P. Co. has established at Swamp point, near Maple bay, Portland canal, in the vicinity of which are some large deposits of limestone on claims purchased by the company in case lime flux shall be needed when the company's blast furnaces shall be running at Anyox, Observatory inlet, a towing distance of 65 miles.

Mr. H. W. DuBois, of Philadelphia, has been investigating a prospective water power on an arm of Quesnel lake, Cariboo district, B.C.

Mr. D. B. Dowling, of the Geological Survey of Canada, left Ottawa on October 23 for the Okotoks district, south of Calgary, Alberta, to make investigations there in connection with the reported recent encountering of oil in a bore in that part of the country.

The death was announced last month of Mr. W. M. Doull, of Montreal, who was associated with the mining and smelting industries of British Columbia through his connection, as president, with the West Kootenay Power & Light Co., which supplies electric power to several of the larger companies engaged in mining and smelting in that province. Mr. Chas. R. Hosmer has succeeded Mr. Doull as president of the Power Company.

Mr. Geo. E. Farish, for some time manager of the Motherlode Sheep Creek Mining Co., operating a gold mine and stamp mill in Nelson mining division, B.C., in which enterprise several Ontario capitalists are largely interested, recently left Nelson for San Francisco.

Mr. Irving R. Gard, for nearly three years engineer in charge of the drafting room of the Canadian Collieries (Dunsmuir), Ltd., at Victoria, B.C., recently left that city for the United States, the important engineering works in hand during the period mentioned having now been advanced nearly to completion. It is probable Kentucky will be the next scene of Mr. Gard's professional activities.

Mr. A. B. W. Hodges, for years local manager in Boundary district of British Columbia for the Granby Consolidated M., S. & P. Co., and afterwards general manager for the Cerro de Pasco Mining Co., at Lima, Peru, has opened a consulting engineering office in Los Angeles, California.

Mr. John Hopp was last month successful in defending his right to the use of water from the upper part of Lightning creek, Cariboo, which right had been disputed by Mr. L. A. Bonner, representing an English company that is engaged in a venture having for its chief object working old river channels for placer gold. Twice part of Mr. Hopp's Lowhee ditch was destroyed by dynamite for which offence Mr. Bonner was sent to jail. During recent months water gates have been surreptitiously opened and the water run to waste. Possibly Mr. Hopp's use of the water will not again be interfered with, but this remains to be seen.

Mr. Ernest Levy, representing in British Columbia Messrs. Alexander Hill & Stewart, of London, engineers in charge of the operation of the mines of the Le Roi No. 2, Ltd., at Rossland, and the Van-Roi Mining Co., in Slocan Lake district, recently spent a week examining mineral claims on Rocher Deboule mountain, in Skeena district, in which Old Country people are interested.

Mr. Oscar Lachmund, general manager for the British Columbia Copper Co., Ltd., has returned to Greenwood, Boundary district, from a visit to the company's headquarters office, in New York.

Mr. Chester F. Lee, of Seattle, Washington, U.S.A., has been examining ground covered by placer-gold leases and extending some ten miles up Similkameen river from Princeton, B.C.

Mr. W. A. McDonald has been appointed manager for the new owners of coal lands on which the Columbia Coal & Coke Co., of Winnipeg, Manitoba, during recent years expended a comparatively large sum of money in doing work that proved of little value in the direction of developing commercial coal. Under the new auspices, exploration and development work will be done on parts of the property believed to give promise of much better results from a coal-mining point of view, while townsite exploitation will be relegated to the background.

Mr. I. L. Merrill, president of the Hedley Gold Mining Co., during October, paid another visit to the company's gold mines and 40-stamp mill, in Camp Hedley, Similkameen, B.C. Other directors of the company were also there. Besides looking through the mine under the guidance of Mr. G. P. Jones, general superintendent, Mr. Merrill gave his attention on the spot to matters connected with the development of additional hydro-electric power preliminary to considerably enlarging the output of ore from the company's Nickel Plate group of mines in which the proved ore reserve at the close of the last fiscal year was estimated at more than 400,000 tons of an average assay value of $11.35 a ton.

Mr. G. J. Milton, manager of the Tantalus coal mine, Yukon Territory, was one of a number of mining men from the North who left the Yukon late in the autumn to spend a winter vacation on "the outside."

Mr. G. W. Otterson, manager for the Kildare Co. on Slate creek, in the Omineca River district of British Columbia, has completed his season's placer-gold mining work and left the district for Ottawa, to report results to his principals.

Mr. H. Peploe Pearse was in Victoria at the end of October from Birch creek, Atlin camp, in which part of British Columbia he has been in charge of hydraulic placer mining for several years.

Mr. Newton W. Pilger, of Butte, Montana, U.S.A., is superintendent at the Iron Mask mine, near Kamloops, B.C., where mining operations were resumed a short time ago. Mr. E. G. Wallinger, of Duluth, Minnesota, is general manager for the United States Company now owning this property.

Mr. Noble W. Pierrie, of Vancouver, B.C., was married to Miss Mabel Corbett on October 16.

Mr. C. H. Poirier, of Poillon & Poirier, New York City, has been examining the Golden Zone mine, in Camp Hedley, B.C.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, last month paid a visit to Barkerville, Cariboo, in company with Dr. Alfred W. G. Wilson of the Mines Branch of the Canada Department of Mines. Returning southward, several days were spent in the vicinity of Slocan lake and of Nelson.

Mr. Elias Rogers, of Toronto, president of the Crowsnest Pass Coal Co., was at the company's mines in Southeast Kootenay, B.C., at the end of October.

Mr. W. J. Rolfe, of Toronto, has been examining mining property in Portland Canal mining division, British Columbia. Mr. Ralph Stokes, who was with him in the Portland Canal Camp, went thence to Juneau, Alaska.

Mr. R. T. Stewart, who for some time had been mine manager for the Corbin Coal and Coke Co., operating in Southeast Kootenay, British Columbia, a short time ago left that ditsrict for the Brazeau coal field in Alberta.

Mr. R. P. Trimble, who for some time past has been actively associated with the development of mineral claims in the Rocher Deboule mountain part of Hazelton district, Omineca mining division, recently left there on a month's visit to Portland, Oregon. He lately arranged to acquire the Great Ohio group of mineral claims, in Rocher Deboule camp, and let a contract for making a trail, erecting buildings and driving an adit.

Mr. John Vallance, for about eight years closely identified with the development of the Standard silver-lead mine, in Silverton camp, B.C., and in recent years mine superintendent there, has left on a visit to Montana, U.S.A.

Mr. W. E. Zwicky, of Kaslo, B.C., for many years in charge of mines in Slocan district, has been on a business trip to Winnipeg, Manitoba.

The Orenstein-Arthur Koppel Co. have issued a catalogue, No. 900, describing rails, tracks, switches, dump cars, platform cars, buckets, electric locomotives, etc. The Canadian Fairbanks-Morse Co., Ltd., Montreal, are the selling agents in Canada.

The McKiernan-Terry Drill Co. has issued a bulletin describingrota ting hammer drills for sinking, stoping and drifting. Canadian Allis-Chalmers, Ltd., Toronto, are the selling agents for Canada.

## HOLLINGER.

Gross profit for the four weeks ending October amounted to $131,510.18.

The approximate average value of all ore hoisted was $17.44.

Waste rock from development amounting to 1.218 tons was hoisted, bringing the total of ore and waste up to 12,650 tons.

Based upon the tonnage of ore and waste hoisted the cost per ton for mining was $2.720.

One thousand tons were added to broken ore reserves.

Two thousand tons were drilled off ready for shooting.

The mill ran 88 per cent. of the possible running time, treating 11,850 tons, of which 164 tons were treated for the Acme Gold Mines, Limited.

The average value of all ore treated was $17.39, approximate extraction 96.70 per cent. Milling cost, $1.594.

Costs show an increase over those previously reported. This increase is primarily due to shutting down the tube mills for the purpose of relining. It will be noted that the mill only ran 88 per cent. of the possible running time, treating 11,850 tons, while the tonnage treated during the previous four weeks was 12,264. This reduction in tonnage treated has naturally resulted in an increase in the costs per ton in all departments.

An unusual item is "strike expense $2,834.30," which has added 24.2 cents per ton to costs. This item included legal fees and expenses incurred during the recent strike and is, we believe, the last expenditure which will be charged under this heading.

Work in the mine continues to show satisfactory progress, 573 feet of drifting having been added to development work during the four weeks. Approximately 100 feet of drifting has been done upon the 425 ft. level upon No. 1 vein, and the values and widths encountered are extremely gratifying, showing as they do that there is no falling off in grade or width of ore.

Work was started upon the winze, which will be carried to 550 feet with as little delay as possible.

## GRANBY.

The Granby management continues to acquire new properties. It has recently exercised its option on the Midas mine in the Valdez section of Alaska, which is showing copper ore running 5 per cent. or better. The Snowshoe claim in the Phœnix camp is understood to have developed satisfactorily, and if the option has not already been exercised, it is expected to be acquired in the near future.

Still a third property is under option which, if present indications hold good, will prove a worthy successor to the original Granby property itself.

Thus far the management has made no statements regarding the extensive development and exploratory work which it has undertaken entirely apart from the Hidden Creek development, but the directors have apparently set out so to rehabilitate the company's ore reserves that earlier errors will be forgiven if not entirely forgotten.—Boston News Bureau.

# SPECIAL CORRESPONDENCE

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Hollinger.**—For the four weeks ending Oct. 7th the Hollinger gold mines made a gross profit of $131,510, against $145,866 in September. This decrease, Mr. Robbins explains, is due to the fact that the tube mills were shut down for the purpose of being relined and the mill only ran 88 per cent. of the possible time. The approximate value of all ore hoisted was $17.44 per ton. The surplus now stands at $722,579. Approximately 100 feet of drifting has been done upon the main vein at the 425 ft. level. There has been no falling off in width or grade of ore.

Mr. P. A. Robbins, general manager, states in his report that the costs show an increase over those previously reported. This increase is primarily due to shutting down the tube mills. The mill only treated 11,850 tons, while the tonnage treated during the previous four weeks was 12,264. This naturally resulted in an increase in the cost per ton in all departments. Work in the mine continues to show satisfactory progress, 573 ft. of drifting having been added to development work during the four weeks.

Based upon the tonnage of ore and waste hoisted the cost per ton for mining was $2.72.

1,000 tons were added to broken ore reserves; 2,000 tons were drilled ready for blasting.

**The Hughes Porcupine Mine** has shut down temporarily. There has been considerable trouble in getting adequate power.

**The Dane Mining Company** lost by fire its cooker, dining-room, office and one bunk-house, with all contents and stores. The loss is estimated at about $5,000. Re-building will commence at once. The property is about six miles from the Dane station on the T. and N. O. property, and the company is mining for copper.

**Teck-Hughes.**—In the place of Mr. John Redington, who has resigned, Mr. Alex. Smith has been appointed. He has taken active charge of operations already. Mr. Alex. Smith is a member of the firm of Carter and Smith in Toronto. He was for some years in South Porcupine, coming to the gold camp from Cobalt. He has had experience in Mexico.

**The Tough-Oakes** property has shipped another car of high grade ore. It consisted of 30 tons and has been sent to Campbell and Deyell for sampling. This makes the fifth car to be shipped from the Tough-Oakes. Previous total tonnage was 104.20; average gold content, 23.37 ounces per ton. This last shipment is said to be of much the same grade as previous consignments.

**McIntyre.**—The September figures of the McIntyre Porcupine mines show that the mill treated 2,786 tons during the month of 30 days, an average of 93 tons of ore per day, producing $28,015, or at the rate of $913 per day. The average value of the ore is thus shown to be $10 a ton. Operating costs $28,127, slightly in excess of the amount produced. During October the mill will treat 135 tons per day, which would be increased to 160 tons per day.

**Hollinger Reserve.**—The Kerr Lake Mining Company is now operating the Hollinger Reserve property in Ogden township. It is now sinking a winze below the 200 ft. level on the main vein. Six weeks ago the Hollinger Reserve claims were sampled by Mr. Robert Livermore for the Kerr Lake, with the result that an option was taken. It is the intention to develop the property at the 300 ft. level. About 40 ft. more of sinking will be necessary to make the next level.

**Porcupine Crown.**—In the 60 ft. of sinking in the winze of the main vein below the 400 ft. level at the Porcupine Crown mine, five feet of vein matter averages $80 to the ton. At 300 ft. the vein showed a continuous ore shoot of 600 ft., being cut off at one end by a fault. The 400 ft. level promises to be fully as long. In regard to the rumor that the company will increase its acreage by the purchase of the Vipond, the Airth and the North Thompson claims, it is understood that nothing definite has been decided upon yet, though undoubtedly negotiations have been entered into.

The September clean-up amounted to $29,000, and as the current expenses were in the vicinity of $4,000, the net surplus was a handsome one.

**North Dome.**—Owing to the unfavourable development of the Timiskaming mine it has been decided to stop work on the North Dome prospect at Porcupine. This property has already been paid for, but it is desired to stop the drain of current expenses for development there and conserve the surplus remaining for the Timiskaming Company to endeavour to find more ore at the silver mine.

**Bartlett and McArthur Township.**—A syndicate of influential Cobalt mining men has taken an option on the St. Paul Hewitt and Hull claims. The operations under the direction of Mr. Robert Bryce have already commenced. These claims are situated in the townships of Bartlett and McArthur, south of the Porcupine district proper. There are five claims in all and stripping will commence at once in order that the veins may be sampled. To date rough sampling indicates the possibilities of a big ore body of low grade. The road has been cut by the government from South Porcupine to the scene of operations.

## COBALT, GOWGANDA, AND SOUTH LORRAIN

**Kerr Lake.**—Results from the draining of Kerr Lake have already been remarkable. The basin of Kerr Lake is now free of water, but there is between 14 and 15 ft. of slime, that will be more difficult to get rid of. Little attempt will be made to do so before the freeze-up this year. However, the banks of the basin are now quite dry, and Kerr Lake has commenced to prospect with remarkable results. Three veins have been discovered on the surface—two to three inches wide of high grade ore. They have also been cut below. Seams that did not appear very profitable to follow up were found to widen out into good high grade ore.

But the remarkable discovery is on the extension of the East Main vein, which has been trenched for 200 to 250 ft. on the surface. For almost the entire length there is high grade ore. At the northern or Drummond end of the property it is from two to three inches wide, but the trench towards the main shaft opened up a remarkable ore body.

The vein runs parallel to shore line of Kerr Lake near the scow upon which the pumps are working, and between them and the camp's buildings. Near the pumps there is a fault, which throws the vein about three ft., and it is remarkably well defined. Alongside the massive smaltite and silver vein which is at this spot from nine to ten inches wide of "plate" silver there runs a small calcite lead, also full of silver. The vein, which has not yet been stripped to the boundary of the Kerr Lake, is heading directly for the Drummond Fraction, and the Caribou-Cobalt. It is probably the main vein of the Drummond, from which so much silver was obtained in the early days of the camp. Very little stoping has been done on the East Main vein above the 140 ft. level. On the 140 ft. level the vein while high grade is not half so wide as on the surface. The last annual report states that the East Main vein has been stoped only a short distance above the 140 ft. level. The production for the year ending August 31 from the East Main was 140,366 ounces only.

The East Main is without doubt the most spectacular surface showing in the Cobalt camp, and it is doubtful if there ever was one to equal it—length, grade and width being all taken into account.

**La Rose**, for the period ending Sept. 30 showed cash and ore in hand of $1,882,833. President McGibbon states that net value production for the first nine ating expenses; the net profits are then equally divided between the Gould and the Porcupine syndicate.

The vein was cut in a cross cut at the 200-foot level, and is about two inches wide. There is little doubt that it is an extension of the Seneca-Superior ore body.

**Penn Canadian.**—Between three and three and a half inches of two thousand ounce ore has been cut in development work on the 300 foot level of the Penn Canadian mine. The crosscut was driven northwest and encountered the ore at a distance of 350 ft. The vein is in the conglomerate.

In addition to the vein proper the wall rock should make good milling ore for several feet. No work had previously been done in this section.

**Crown Reserve.**—Some ore shoots hitherto overlooked in old stopes of the Crown Reserve have been found within the past month. New ore bodies have been found on No. 14 on the 200 and 220 ft. levels and on Nos. 17 and 24 on the 100 ft. level. On the 100 ft. level some high grade has been found on the No. 14

**Kerr Lake as it appears to-day**

months amounted to $905,039. More high grade ore had been taken out than had been estimated in the reserves at the beginning of the year and profit on mill rock has been 23 per cent. of the total estimated as the reserves, while the dumps remain practically unchanged. On the other hand, the high grade ore reserves are considerably less.

Pan Silver.—Some patches of high grade ore have been found on both the Calumet and Patterson claims of the Pan Silver Mining Company in Southeast Coleman. These finds were made in crosscuts at the 200 ft. level. The Pan Silver is controlled by the Cartwright interests.

**Gould.**—After four or five years of more or less continuous development some high grade ore has at length been found on the Gould lease on Peterson Lake. This lease is being worked by the Porcupine syndicate. The Porcupine syndicate pays 25 per cent. gross royalty of all ore mined to Peterson Lake and deducts the oper-

vein in the west drift at a point believed to be barren. No. 2 is also yielding unexpectedly good results.

**Temiskaming and Hudson Bay.**—At the annual meeting of the Temiskaming and Hudson Bay Mining Company in New Liskeard the following officers and directors were elected. Geo. Taylor, president; A. A. McKelvie, vice-president. Directors—Messrs. T. McCamus, D. M. Ferguson, John Duncan, S. S. Ritchie, D. L. Sherrill; secretary treasurer, F. L. Hutchison. The only new member of the board is D. L. Sherrill of Buffalo.

The total production for the year was 659,927 ounces, or a slight falling off as compared with last year. The cost per ounce was 18 cents, dividends paid during the year, 2,400 per cent, or $186,264.

The work on the Gowganda property was discontinued in July.

The Hudson Bay output for the month of September was 1,776 tons crushed; average assay head ounces, 23.9; average assay tails from the mill, 3.1 ounces; extraction per cent., 87.4; month's production, 42.643 ounces.

**Colonial.**—Working with one machine on the lowest level of the Colonial, the man left in charge of that property, which has been shut down for some time, found some good ore. Two rounds were taken out in an old drift when the good ore came in. The vein itself is about two inches wide of high grade, and there appears to be some milling rock.

**Caribou-Cobalt.**—Recent developments on the Caribou-Cobalt include opening up of high grade ore on vein 11 at the 100 ft. level and the cutting of two high grade veins in No. 5 shaft. Drifting on the 100 ft. level of Vein No. 11 has opened up an ore body 50 ft. long, one to three inches wide of high grade ore, together with mill rock extending from two to four feet on each side of the vein assaying from 25 to 30 ounces. Ore of the same quality still continues in the breast of the drift. A cross cut driven on the 100 ft. level of No. 5 shaft, under the old workings at No. 1 shaft, has cut two high grade veins, each one to two inches wide, of 2.000 ounce ore. The adjacent mill rock assays 30 ounces. The property has been milling about 100 tons daily at the mill of the Dominion Reduction Company, and the Northern Customs concentrator.

**Extension of East Main vein, Kerr Lake Mining Co. Vein is here 9 to 10 inches wide of bonanza ore.**

## NOVA SCOTIA

**The Dominion Explosives Act.**—An article went the round of the Canadian newspapers recently which forecasted a great improvement in mining conditions and a decrease in mining accidents when the regulations of the new Federal Explosives Act become effective. There appears to be considerable misapprehension with regard to the scope and intent of this salutary enactment. It is not in any sense an "Explosives in Mines Act," similar to the regulations governing the use of explosives in coal mines in Great Britain before the passing of the Consolidated Coal Mines Regulation Act last year. The intention of the Dominion Explosives Act is more particularly to regulate the manufacture and the transportation of explosives. It provides for proper and safe conditions in explosives manufactories and for standardization of the ingredients and the quality of explosives, and provides machinery for the establishment of a list of "Permitted Explosives" along the lines followed by the Home Office in Great Britain. Provision is also made for safeguards in transportation. The new legislation has for some time been necessary, as it is apparent that the manufacture and transportation of such a dangerous commodity can be properly regulated only by a Federal law, seeing that explosives made in one Province may be intended for use in several different Provinces. It is slightly gratuitous, however, to conclude that there will be any diminution of mining accidents when the new bill becomes law, at any rate, so far as the coal mines of Nova Scotia are concerned. There have been some very distressing accidents arising from the careless and improper handling of explosives in railway construction work in Canada, but the percentage of accidents in coal mines arising from the use of explosives is quite small. It is, however, a matter for congratulation that the tendency of modern coal mining practice is towards the elimination of the use of explosives in coal getting, and coal operators, of their own initiative, are continually making more stringent the regulations governing the firing of shots.

**The Stag Canon Explosion.**—The Nova Scotian readers of the Journal were interested to notice that the rescue corps who endeavoured to penetrate the workings of the Stag Canon mine, near Dawson, New Mexico, after the recent explosion, were headed by Mr. J. B. Morrow, of Halifax. Mr. Morrow canvassed the Province for the Canadian Mining Journal in 1907, shortly after the familiar present cover of the Journal replaced its predecessor the Canadian Mining Review. For some time Mr. Morrow has been in charge of the well-equipped station of the Stag Canon Company, and his friends will await with interest more definite accounts of the rescue work in which he took part. The explosion has also further interest for Canadian readers in that one of the principal shareholders is Dr. James Douglas, a gentleman whose benefactions to students of mining in the Dominion are well known.

**October Output.**—As forecasted in the middle of the month the outputs from the Glace Bay Mines of the Dominion Coal Company in October will total 437,000 tons, or 12,000 tons greater than the largest previous monthly output record. As October is for some reason invariably a good producing month it is more than likely that this new record will remain unapproached for some time to come.

**Broughton Mine.**—The first coal shipments from the Broughton mines were made towards the end of October. An arrangement has been come to between the Dominion Coal Company and the Cape Breton Coal, Iron & Railway Company covering the transportation of coal from the Broughton mine to Louisburg pier, and regular shipments will no doubt be made from now on. The Cape Breton Co. has received 30 wooden cars, of thirty tons' capacity each. The Broughton colliery is putting out about 100 tons daily. Now that arrangements have been made for shipping, the output will be increased.

## BRITISH COLUMBIA

News from Atlin and Cariboo districts is to the effect that in those placer-gold mining camps the season's gravel-washing operations are practically at an end. No particulars of the quantity of gold recovered are yet available, but it is probable that the production of the 1912 season has been exceeded. The figures for last year were: Yield of Cariboo district, Cariboo division, $180,000; Quesnel division, $50,000; total, $230,000. Of Atlin division, $290,000. Then there was $8,000 from Omineca division, $9,000 from several divisions in Cassiar district, and $18,500 from various other parts of the Province. The total value of the year's production of placer gold was $555,500. It is quite probable the 1913 total yield will be found to have been the highest in value of any year since 1907.

In connection with lode mining, a noticeable feature is the considerable increase in the quantity of ore received at the Consolidated Company's smeltery at Trail. For the week ended October 30, the quantity received was 9,460 tons, while for the immediately preceding week it was 9,197 tons. The highest weekly figures in previous recent weeks were—for week ended Sept. 18 7,950 tons and Sept. 4 7,917. The greater part of the increased quantity came from the company's own mines, though the Bluebell in Ainsworth division, the Standard in Slocan, and the Iron Mask at Kamloops each contributed appreciably to the total increase.

### CARIBOO.

**Barkerville.**—The manager of the John Hopp hydraulic placer-gold mines early in October stated that there was enough water in the big reservoir on one of the properties to allow of continuance of sluicing until about the end of the month. Shortly afterward the first snowfall of the season occurred; about two inches of snow fell, but bright weather following, it quickly melted. At the end of October the indications were that there would be several weeks of "Indian summer" before the winter set in.

The Supreme Court of British Columbia has dismissed, with costs against the plaintiff company, an action of the Lightning Creek Hydraulic Co. vs. John Hopp, claiming an injunction against the defendant's further use of certain water, and damages. The plaintiff company alleged that under a water record obtained in 1897 it was entitled to 1,000 inches of water from Lightning creek, and that the defendant had taken water from above plaintiff's intake, thus diverting water the latter should have had. Defendant contended that plaintiff's water record lapsed in 1902, while his own record for 500 inches of water, obtained in 1898, had ever since been kept in good standing, so that he was entitled to the water. The dispute had attracted general attention among those interested in placer-mining in the district, where Mr. Hopp has for years operated large hydraulic mines.

**Quesnel.**—Mr. Hebson reports that excellent progress has been made in the development of the Yanks mineral claim, on Snowshoe creek. In the lower tunnel the vein is 8 ft. in width, and the ore contains good value in gold.

### LILLOOET.

From the Lillooet Prospector it is learned that Mr. J. M. Williams in the later half of October went to property of the McGillivray Mountain Mines, Ltd., accompanied by several miners, to do development work through the winter. It is stated that Mr. F. J. Crossland's report on the property is so favourable that those interested have decided to proceed to develop it.

Mr. Fred. M. Wells, who in quite recent years has been in charge of development work at the mine of the Surf Inlet Gold Mines, Ltd., on Princess Royal Island, lately examined Dr. Christie's mineral claims on a tributary of the north fork of Bridge river, on which there has been opened a quartz vein containing gold, silver, and copper.

For many years a noted Indian character was accustomed to periodically put in an appearance at Lillooet with gold, but it was not during his lifetime discovered where he obtained it. Since his death another Indian, known as Mission Peter, has been searching for the source of riches so long kept secret. Lately he induced Mr. C. L. Copp, for some time superintendent for the Coronation Mines, Ltd., operating on Cadwallader creek, a tributary of Bridge river, to go with him to the vicinity of Whitewater river. Since their return to Lillooet the statement has been published that an old sluice box was shown to Mr. Copp at one place where placer mining had been done years ago, and, on prospecting the ground, good results were obtained, the gold obtained being coarse. It is claimed that not only has a new placer field been found, but that there were seen in the neighboring country indications of gold-bearing quartz.

### AINSWORTH.

Shipment of ore from the Highland mine adds another to the list of producers in Ainsworth camp. The Consolidated Mining & Smelting Co. has acquired this property; the concentrating mill has been overhauled, the aerial tramway from mine to mill put in running order, and development work undertaken. Latterly shipment of ore has been in progress.

In the western part of Ainsworth mining division, work has been continued at the Utica; driving another cross-cut adit on the Eureka is making satisfactory progress; some ore is being sent out from the U.S. claim in Jackson basin; further development of the Whitewater group by Retallack & Co. is being pushed on, and supplies have been taken up to the Panama so that work may be continued throughout the winter.

### SLOCAN.

A proposed reorganization of the Lucky Jim Zinc Mines, Ltd., is being considered. The present pressing need is money—to pay off existing debts and make provision for concentrating the large quantity of available ore unsuitable for shipment without previous concentration.

Encouraging reports come from the Rambler-Cariboo mine, which is stated to now be realizing a fair profit on mining and milling operations. The work of driving a deep-level crosscut adit on the Payne is being continued; near Sandon, the Richmond-Eureka, Ruth, Slocan Star, and Wonderful are all being worked; in the vicinity of Cody, the Colonial, Reco, Surprise, and Noble Five, have all been operative, and work is to be continued throughout the winter at most of them. Near New Denver, the Apex is being developed; in Silverton camp, the Standard is well maintaining production and doing important new development work as well, the Hewitt mill is being prepared for operation, the outlook for the Van-Roi has improved, and the Lucky Thought is making promising progress. In Slocan City division, the Eastmont, Neepawa, Black Prince, Ottawa, and others are being worked.

# STATISTICS AND RETURNS

## COBALT SHIPMENTS.

No less than nineteen cars left the Cobalt camp from Cobalt and Kerr Lake last week, but the fact that half of this was low grade indicates that the great increase in tonnage did not necessarily mean the same proportion of increase in silver ounces.

The Trethewey shipped two cars, one of high grade ore and one of low grade. The Crown Reserve car went to Hamburg, Germany, and was of very high grade ore.

Bullion shipments were lower than usual. Kerr Lake is now marketing its own bullion.

The shipments from the Cobalt camp for the week ending Nov. 7 were:

| | High. | Low. | Total |
|---|---|---|---|
| Cobalt Townsite. . . . . . . | | 504,000 | 504,000 |
| Trethewey. . . . . . . . . . . . | 50,870 | 42,380 | 93,250 |
| Penn-Can. . . . . . . . . . . . | 101,490 | | 101,490 |
| Cobalt Lake . . . . . . . . . . | 62,950 | | 62,950 |
| Coniagas. . . . . . . . . . . . | 257,000 | | 257,500 |
| Crown Reserve . . . . . . . . | 62,850 | | 62,850 |
| La Rose . . . . . . . . . . . . . . | 87,010 | 80,000 | 167,010 |
| McKinley-Dar. . . . . . . . . | 56,460 | | 167,010 |
| | 679,460 | 626,380 | 1,305,840 |

The bullion shipments for the week ending Nov. 7, were:

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing. . . . . . . . . . | 87 | 102,812.77 | $61,687.36 |
| Kerr Lake. . . . . . . . . | 14 | 15,152.00 | 7,291.00 |
| | 101 | 117,964.77 | $68,478.36 |

The bullion shipments for the year now total:

| | Ounces. | Value. |
|---|---|---|
| Nipissing. . . . . . . . . . . . . | 5,147,596.91 | $2,958,900.08 |
| Penn-Can. . . . . . . . . . . . . | 31,299.60 | 18,750.90 |
| Buffalo. . . . . . . . . . . . . . . | 1,301,409.90 | 809,301.57 |
| Crown Reserve . . . . . . . . . | 428,060.00 | 261,278.25 |
| Dom. Red. . . . . . . . . . . . . | 373,672.40 | 216,385.00 |
| Townsite. . . . . . . . . . . . . . | 36,818.40 | 30,364.04 |
| Miscellaneous. . . . . . . . . . | 3,920.00 | 1,623.00 |
| Timiskaming. . . . . . . . . . . | 25,561.70 | 14,948.04 |
| O'Brien. . . . . . . . . . . . . . | 146,542.77 | 78,423.66 |
| Wettlaufer. . . . . . . . . . . . | 15,869.00 | 9,757.00 |
| Miller Lake. . . . . . . . . . . | 3,710.20 | 2,053.00 |
| Colonial. . . . . . . . . . . . . . | 635.00 | 374.00 |
| Trethewey. . . . . . . . . . . . | 15,199.83 | 9,300.04 |
| Casey Cobalt. . . . . . . . . . | 2,394.00 | 1,520.00 |
| Kerr Lake. . . . . . . . . . . . | 82,969.79 | 48,164.48 |
| Bailey. . . . . . . . . . . . . . . | 1,839.00 | 1,103.40 |
| Cobalt Lake . . . . . . . . . . | 1,717.80 | 996.36 |
| City of Cobalt. . . . . . . . . | 2,808.45 | 1,702.00 |
| Preston E. D. . . . . . . . . . | 3,452.60 | 2,002.50 |
| Cob. Comet . . . . . . . . . . . | 3,503.65 | 2,079.13 |
| Lumsden. . . . . . . . . . . . . | 1,814.40 | 1,079.00 |
| Beaver . . . . . . . . . . . . . . . | 1,837.00 | 1,138.94 |
| Hargraves. . . . . . . . . . . . | 1,977.00 | 1,205.00 |
| McKinley-Dar. . . . . . . . . | 17,158.00 | 10,294.00 |
| | 7,640,759 | $4,524,853.89 |

## BRITISH COLUMBIA ORE SHIPMENTS.

Ore receipts at the Consolidated Mining and Smelting Co.'s works at Trail during the four weeks ended October 23, were as under:

| | | Tons. |
|---|---|---|
| **From East Kootenay—** | | |
| Monarch . . . . . . . . . . . . . . . . | | 158 |
| St. Eugene. . . . . . . . . . . . . . . | | 122 |
| Sullivan. . . . . . . . . . . . . . . . . | | 3049 |
| | | 3,329 |
| **Ainsworth—** | | |
| Blue Bell. . . . . . . . . . . . . . . . | | 947 |
| Highland. . . . . . . . . . . . . . . . | | 219 |
| No. 1. . . . . . . . . . . . . . . . . . . | | 374 |
| Retallack & Co. . . . . . . . . . . . | | 85 |
| Silver Hoard. . . . . . . . . . . . . | | 199 |
| Utica. . . . . . . . . . . . . . . . . . . | | 38 |
| | | 1,862 |
| **Slocan—** | | |
| Black Prince. . . . . . . . . . . . . | | 41 |
| Eastmont. . . . . . . . . . . . . . . . | | 18 |
| Idaho-Alamo. . . . . . . . . . . . . | | 45 |
| Ottawa. . . . . . . . . . . . . . . . . | | 34 |
| Rambler-Cariboo . . . . . . . . . | | 236 |
| Richmond-Eureka. . . . . . . . . | | 101 |
| Ruth. . . . . . . . . . . . . . . . . . . | | 72 |
| Slocan Star . . . . . . . . . . . . . | | 62 |
| Standard. . . . . . . . . . . . . . . . | | 1543 |
| Surprise. . . . . . . . . . . . . . . . | | 56 |
| Sundry small lots. . . . . . . . . | | 18 |
| | | 2,226 |
| **Nelson—** | | |
| Big Bump. . . . . . . . . . . . . . . | | 26 |
| Emerald. . . . . . . . . . . . . . . . | | 74 |
| Molly Gibson. . . . . . . . . . . . | | 364 |
| Queen. . . . . . . . . . . . . . . . . . | | 74 |
| Second Relief. . . . . . . . . . . . | | 38 |
| Silver King. . . . . . . . . . . . . . | | 1032 |
| Yankee Girl . . . . . . . . . . . . . | | 325 |
| | | 1,933 |
| **Rossland—** | | |
| Centre Star Group . . . . . . . . | 12,798 | |
| Josie (Le Roi No. 2, Ltd.). . . . | 1,604 | |
| Le Roi. . . . . . . . . . . . . . . . . . | 6,465 | |
| | | 20,867 |
| **Lardeau—** | | |
| Ajax. . . . . . . . . . . . . . . . . . . | | 68 |
| **Kamloops** | | |
| Iron Mask. . . . . . . . . . . . . . . | | 277 |
| **Boundary—** | | |
| Rob Roy and Belle . . . . . . . . | | 16 |
| **State of Washington, U.S.A.—** | | |
| Ben Hur (Republic Camp). . . . | 1,127 | |
| Bonanza . . . . . . . . . . . . . . . . | 125 | |
| Paragon. . . . . . . . . . . . . . . . | 7 | |
| United Copper (Chewelah) . . . | 211 | |
| | | 1,470 |
| Total. . . . . . . . . . . . . . . . . . | | 32,048 |

# MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

November 10, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| American Marconi | 3.25 | 3.50 |
| Alaska Gold | 20.12½ | 20.37½ |
| British Copper | 2.37½ | 2.50 |
| Braden Copper | 6.25 | 6.50 |
| California Oil | 190.00 | 192.00 |
| Chino Copper | 36.50 | 36.75 |
| Giroux Copper | 1.12 | 1.50 |
| Green Can. | 6.00 | 7.00 |
| Granby | 65.00 | 68.00 |
| Miami Copper | 21.00 | 22.00 |
| Nevada Copper | 14.00 | 14.25 |
| Ohio Oil | 131.00 | 133.00 |
| Ray Cons. Copper | 17.25 | 17.50 |
| Standard Oil of N. Y. | 152.00 | 154.00 |
| Standard Oil of N. J. | 373.00 | 376.00 |
| Standard Oil (old) | 1150.00 | .... |
| Standard Oil (subs.) | 725.00 | .... |
| Tonopah Mining | 4.50 | 4.75 |
| Tonopah Belmont | 7.12½ | 7.25 |
| Tonopah Merger | .57 | .59 |
| Inspiration Copper | 14.00 | 15.00 |
| Goldfield Cons. | 1.43 | 1.50 |
| Yukon Gold | 2.00 | 2.12 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .01 |
| Dome Extension | .05½ | .06 |
| Dome Lake | .18 | .18½ |
| Dome Mines | 9.75 | 10.50 |
| Eldorado | .00½ | .001 |
| Foley-O'Brien | .15 | .17 |
| Hollinger | 17.70 | 17.90 |
| Jupiter | .09 | .09⅛ |
| McIntyre | 1.50 | 1.80 |
| Moneta | .02 | .04 |
| North Dome | .... | .40 |
| Northern Exploration | .75 | 1.25 |
| Pearl Lake | .11½ | .12 |
| Plenaurum | .... | .70 |
| Porcupine Gold | .11 | .11¼ |
| Imperial | .01½ | .02 |
| Porcupine Reserve | .... | .06 |
| Preston East Dome | .01½ | .02 |
| Rea | .12 | .18 |
| Swastika | .03 | .03¼ |
| Standard | .00½ | .01 |
| United | .... | .01 |
| West Dome | .05 | .10 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey | .07 | .07¼ |
| Beaver | .33½ | .34 |
| Buffalo | 1.70 | 1.75 |
| Canadian | .12 | .20 |
| Chambers Ferland | .12¾ | .13 |
| City of Cobalt | .25 | .35 |
| Cobalt Lake | .53 | .59 |
| Coniagas | 7.25 | 7.50 |
| Crown Reserve | 1.75 | 1.78 |
| Foster | .07½ | .09 |
| Gifford | .0½ | .02 |
| Gould | .04¼ | .04⅜ |
| Great Northern | .09½ | .10 |
| Hargraves | .02½ | .04 |
| Hudson Bay | 69.00 | 70.00 |
| Kerr Lake | 4.30 | 4.40 |
| La Rose | 1.75 | 1.77 |
| McKinley | 1.31 | 1.35 |
| Nipissing | 7.60 | 7.70 |
| Peterson Lake | .27 | .27¼ |
| Right of Way | .04 | .05 |
| Rochester | .03 | .04 |
| Leaf | .01¾ | .02 |
| Cochrane | .... | .40 |
| Silver Queen | .04 | .05 |
| Timiskaming | .12 | .12½ |
| Trethewey | .27 | .29 |
| Wettlaufer | .07 | .09 |
| Seneca Superior | 2.25 | 2.50 |
| Porcupine Crown | 1.25 | 1.30 |
| Teck-Hughes | .... | .... |

## TORONTO MARKETS.

Nov. 11—(Quotations from Canada Metal Co., Toronto).
- Spelter, 5 cents per pound.
- Lead, 5. 75 cents per pound.
- Tin, 43 cents per pound.
- Antimony, 8½ cents per pound.
- Copper, casting, 17 cents per pound.
- Electrolytic, 17½ cents per pound.
- Ingot brass, 11 to 15 cents per pound.

Nov. 11—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).
- Summerlee No. 1, $26.00 (f.o.b. Toronto).
- Summerlee No. 2, $25.00 (f.o.b. Toronto).

Nov. 11—(Quotations from Elias Rogers Co., Toronto).
- Coal, anthracite, $8.00 per ton.
- Coal, bituminous, lump, $5.25 per ton.

## GENERAL MARKETS.

Nov. 7.—Connellsville coke (f.o.b. ovens).
- Furnace coke, prompt, $1.90 per ton.
- Foundry coke, prompt, $2.75 per ton.

Nov. 7—Tin, straits, 40.00 cents.
- Copper, prime lake, 16.62½ cents.
- Electrolytic copper, 16.25 cents.
- Copper wire, 17.50 to 17.75 cents.
- Lead, 4.35 cents.
- Spelter, 5.37½ cents.
- Sheet zinc (f.o.b. smelter), 7.50 cents.
- Antimony, Cookson's, 7.55 to 7.60 cents.
- Aluminum, 19.75 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, hard, 10 per cent., $46.00 to $48.50 per ounce.
- Platinum, hard, 20 per cent., $50.00 to $52.50 per ounce.
- Bismuth, $1.95 to $2.15 per pound.
- Quicksilver, $38.00 per 75-lb. flask.

## SILVER PRICES.

| | New York. cents. | London. pence. |
|---|---|---|
| Oct. 24 | 60¼ | 27⅞ |
| " 25 | 60 | 27¾ |
| " 27 | 60⅛ | 27 13/16 |
| " 28 | 59¾ | 27⅝ |
| " 29 | 59½ | 27½ |
| " 30 | 59½ | 27½ |
| " 31 | 59¾ | 27⅝ |
| Nov. 1 | 59⅝ | 27 9/16 |
| " 3 | 59⅜ | 27 7/16 |
| " 4 | .. | 27 7/16 |
| " 5 | 59½ | 27½ |
| " 6 | 59⅞ | 27 11/16 |
| " 7 | 59⅞ | 27 11/16 |
| " 8 | 59⅞ | 27 9/16 |
| " 10 | 59½ | 27 9/16 |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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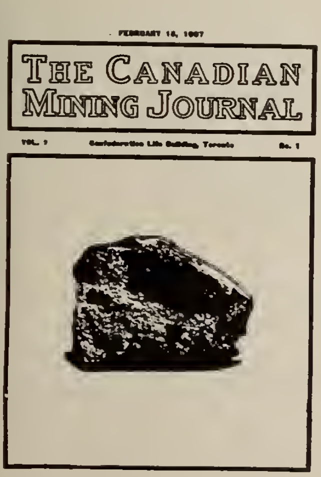


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The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*

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The Mining Law gives absolute security of Title and is very favourable to the Prospector.

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The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

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Deposits of particularly high grade manganese ore occur at a number of different localities.

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In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output

The mining laws of Ontario are liberal, and the prices of mineral lands low.

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For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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- Fraser & Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Jenckes Machine Co.
- Mussens, Limited.
- Northern Canada Supply Co.

**Cables—Wire—**
- Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
- Jeffrey Mfg. Co.
- Mussens, Ltd.
- Northern Canada Supply Co.
- Jenckes Bros.
- Orenstein Arthur Koppel Co

**Cement Machinery—**
- Canadian Allis-Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Northern Canada Supply Co.
- Peacock Brothers.

**Chains—**
- Jeffrey Mfg. Co.
- Peacock Brothers.
- Jones & Glassco.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co.
- B. Greening Wire Co., Ltd.
- Northern Canada Supply Co.

**Chemists—**
- Canadian Laboratories.
- Campbell & Deyell.
- Thos. Heys & Son.
- Milton Hersey Co.
- Ledoux & Co.

**Coal—**
- Dominion Coal Co.
- Nova Scotia Steel & Coal Co.

**Coal Cutters—**
- Canadian Allis-Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Sullivan Machinery Co.
- Can. Ingersoll-Rand Co., Ltd.
- Peacock Bros.
- Mussens, Limited.

**Coal Mining Explosives—**
- Curtis & Harvey (Can.), Ltd

**Coal Mining Machinery—**
- Can. Ingersoll-Rand Co., Ltd.
- Fraser & Chalmers, Ltd.
- Peacock Brothers.
- Jeffrey Mfg. Co.
- Head, Wrightson & Co., Ltd.

**Coal Punchers—**
- Sullivan Machinery Co.
- Canadian Ingersoll-Rand Co., Ltd.

**Coal Washeries—**
- Jeffrey Mfg. Co.
- Mussens, Limited.
- Peacock Brothers.
- Head, Wrightson & Co., Ltd.

**Compressors—Air—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Sullivan Machinery Co.
- Canadian Allis-Chalmers, Ltd.
- Laurie & Lamb.
- Canadian Westinghouse.
- Can. Ingersoll-Rand Co., Ltd.
- Cleveland Pneumatic Tool Co. of Canada, Ltd.
- Mussens, Limited.
- Peacock Brothers.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Concentrators and Jigs.**
- Canadian Allis-Chalmers, Ltd.
- Diester Machine Co.
- Fraser & Chalmers, Ltd.
- Jenckes Machine Co.
- James Ore Concentrator Co.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
- Canadian Allis-Chalmers, Ltd.
- Peacocks Brothers.
- Mussens, Limited.
- Northern Canada Supply Co.

**Condensers—**
- Canadian Allis-Chalmers, Ltd.
- E. Leonard & Sons.
- Fraser & Chalmers, Ltd.
- Smart-Turner Machine Co., Ltd.
- Peacock Brothers.
- Laurie & Lamb.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Converters—**
- Canadian Westinghouse.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.

**Conveyors—Belt—**
- Head, Wrightson & Co., Ltd.
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Jenckes Machine Co.
- Northern Canada Supply Co.
- Peacock Brothers.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Waterous Engine Works.
- Canadian Fairbanks-Morse, Co., Ltd.

**Cranes—**
- SmartTurner Machine Co.
- Peacock Brothers.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co., Ltd.
- M. Beatty & Sons, Ltd.
- Krupp, Fried. A. G., Germany.

**Crane Ropes—**
- Allan, Whyte & Co.
- Thos. & Wm. Smith.
- B. Greening Wire Co., Ltd.

**Crushers—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Jenckes Machine Co.
- Peacock Brothers.
- Lymans, Limited.
- Can. Fairbanks-Morse Co.
- Mussens, Limited.
- Hadfields Steel Foundry Co.

**Cyanide Plants—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Roessler & Hasslacher.
- Mussens, Limited.
- Thomas & William Smith.
- Peacock Brothers.

**Derricks—**
- Smart-Turner Machine Co.
- S. Flory Mfg. Co.
- M. Beatty & Sons, Ltd.
- Mussens, Limited.

**Diamond Drill Contractors—**
- Diamond Drill Contracting Co.
- Smith & Travers.

**Dredging Machinery—**
- Canadian Allis-Chalmers, Ltd.
- Peacock Brothers.
- M. Beatty & Sons.
- Mussens, Limited.

**Dredging Ropes—**
- Allan, Whyte & Co.
- Fraser & Chalmers, Ltd.
- B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**
- Canadian Allis-Chalmers, Ltd.
- Can. Ingersoll-Rand Co., Ltd.
- Mussens, Limited.
- Jeffrey Mfg. Co.
- Sullivan Machinery Co.
- Peacock Brothers.
- Northern Canada Supply Co.

**Drills—Core—**
- Can. Ingersoll-Rand Co., Ltd.
- Canadian Allis-Chalmers, Ltd.
- Standard Diamond Drill Co.

**Drills—Diamond.**
- American Diamond Rock Drills.
- Sullivan Machinery Co.
- Northern Canada Supply Co.

**Drill Steel Sharpeners—**
- Canadian Ingersoll-Rand Co.
- Northern Canada Supply Co.

**Drills—Electric—**
- Canadian Allis-Chalmers, Ltd.
- Mussens, Limited.
- Siemens Co. of Can., Ltd.
- Canadian Ingersoll-Rand Co.

**Dump Cars—**
- Sullivan Machinery Co.
- Waterous Engine Works Co.
- Mussens, Limited.
- Orenstein-Arthur Koppel Co.

**Dynamite—**
- Curtis & Harvey (Canada). Limited.
- Canadian Explosives.
- Northern Canada Supply Co.

**Dynamos—**
- Can. Westinghouse Co.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Canada, Ltd.

**Ejectors—**
- Mussens, Limited.
- Peacock Brothers.
- Canadian Ingersoll-Rand Co., Ltd.
- Northern Canada Supply Co.

**Elevators—**
- Canadian Allis-Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Krupp, Fried. A. G., Germany.
- M. Beatty & Sons.
- Sullivan Machinery Co.
- Northern Canada Supply Co.
- Waterous Engine Works.
- Jenckes Machine Co.
- Can. Fairbanks-Morse Co.
- Mussens, Limited.
- Peacock Brothers.

**Engineering Instruments—**
- C. L. Berger & Sons.
- Peacock Brothers.

**Engineers and Contractors—**
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Roberts & Schaefer Co.

**Engines—Automatic—**
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- Waterous Engine Works Co.
- The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Mussens, Limited.
- E. Leonard & Sons.
- Alex. Fleck.
- Sullivan Machinery Co.
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- M. Beatty & Sons.
- Canadian Westinghouse.
- John Inglis & Co., Ltd.
- Can. Fairbanks-Morse Co.

**Engine—Haulage—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Peacock Brothers.
- E. Leonard & Sons.
- Jenckes Machine Co.

**Engines—Marine—**
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- The John Englis Co., Ltd.
- Can. Fairbanks-Morse Co.

**Engines—Oil—**
- Jenckes Machine Co.
- Peacock Brothers.
- Can. Fairbanks-Morse Co.

**Engines—Steam—**
- Canadian Allis-Chalmers, Ltd.
- E. Leonard & Sons.
- Fraser & Chalmers, Ltd.
- Smart-Turner Mahine Co.
- Robb Engineering Co.
- S. Flory Mfg. Co.
- Jenckes Machine Co.
- Alex. Fleck.
- Peacock Bros.
- M. Beatty & Sons.
- Laurie & Lamb.
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- The John Inglis Co., Ltd.

**Fans—Ventilating—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Sullivan Machinery Co.
- Peacock Brothers.
- Mussens, Limited.

**Feeders—Ore—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried, A. G., Germany.
- Mussens, Limited.

**Filters—**
- Krupp, Fried, A. G., Germany.

**Forges—**
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- Northern Canada Supply Co. Ltd.

**Forgings—**
- M. Beatty & Sons.
- Canadian Cleveland Drill Co.
- Smart-Turner Machine Co.
- Peacock Brothers.

**Furnaces—Assay—**
- Krupp, Fried, A. G., Germany.
- Lymans, Limited.
- Mussens, Limited.

**Fuse—**
- Peacock Brothers.
- Curtis & Harvey, (Canada). Limited.
- Canadian Westinghouse.
- Canadian Explosives.
- Mussens, Limited.
- Northern Canada Supply Co.

**Gears—**
- Canadian Westinghouse.
- Krupp, Fried, A. G., Germany.
- Smart-Turner Machine Co.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Generators—**
- Canadian Westinghouse.
- Peacock Brothers.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Canada., Ltd.

**Girders—Steel—**
- Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghiouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co. Ltd
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty & Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
Consolidated Mining & Smelting Co.
Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Canadian Allis-Chalmers, Ltd.
Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumotic—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rrand Co.

**Pumps—Sinking—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Can. Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A.G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.

**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd

**Roofing—**
Patterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Hays & Sons.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Can. Allis-Chalmers, Ltd.
Peacock Bros.
Waterous Engine Co.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.

**Shavels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Diester Concentrator Co.
James Ore Concentrator.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Smelting Machinery—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Allis-Chalmers.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Bros.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co. Ltd.
Peacock Brothers.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
John Davis & Son.
Consolidated Optical Co. Ltd

**Switchboards—**
Canadian Westinghouse.
Can. Allis-Chalmers, Ltd.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
E. Leonard & Sons.
Peacock Bros.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Can. Allis-Chalmers Ltd
Jenckes Machine Co.

**Transformers—**
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Sons.
Peacock Brothers.

**Tractors—Oil—**
Canadian Fairbanks-Morse Co., Ltd.

**Tube Mills—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Turbines—**
Canadian Westinghouse.
Peacock Brothers.
Laurie & Lamb.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
Krupp, Fried. A. G., Germany,
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.

**Water Wheels—**
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Krupp, Fried. A. G., Germany.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser Chalmers, Ltd.
E. Leonard & Sons.
Siemens Co. of Can., Ltd.

**Wire Cloth—**
Can. Allis-Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.
B. Greening Wire Co.

**Wire (Bare and Insulated)—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
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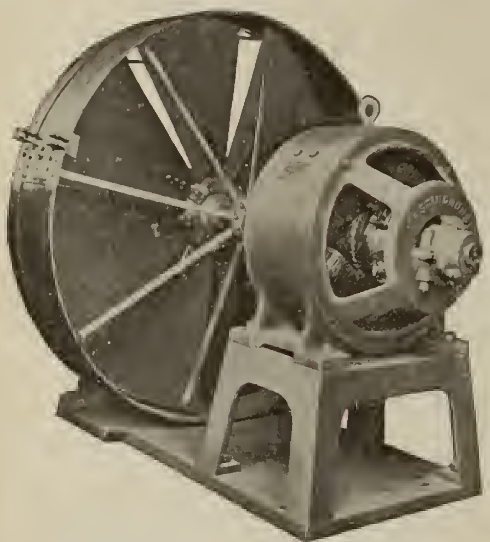

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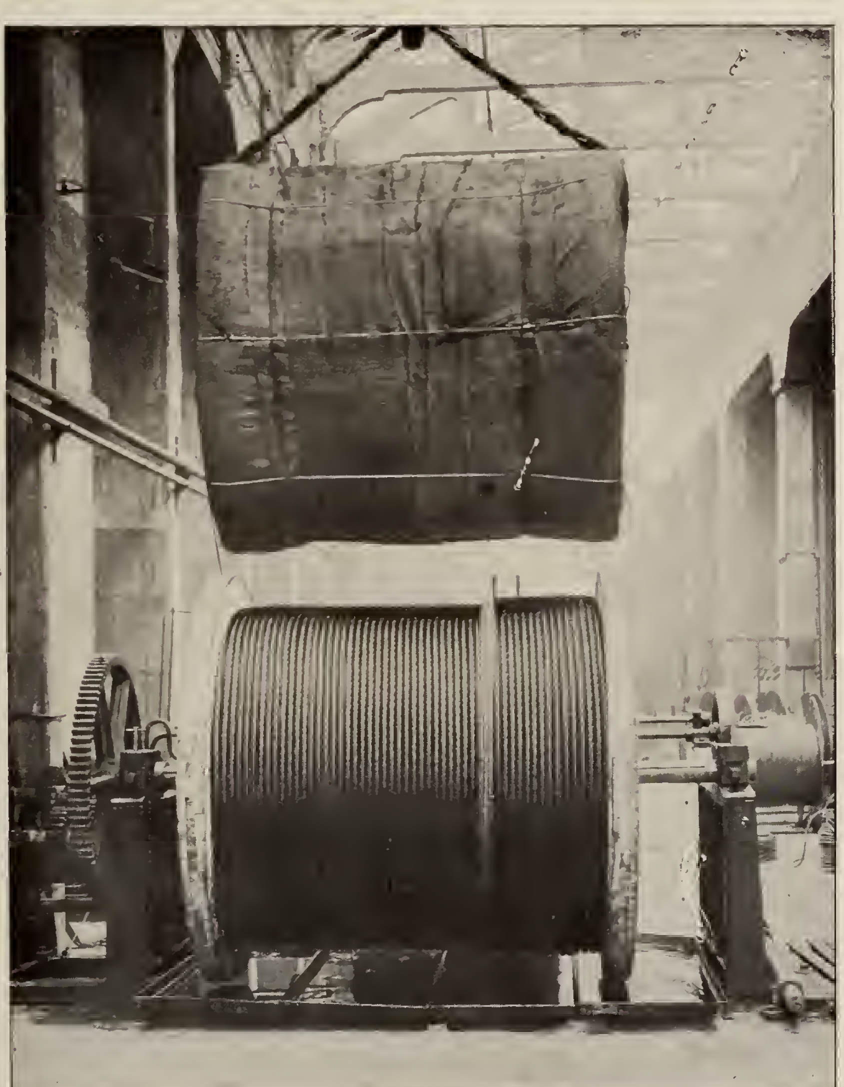

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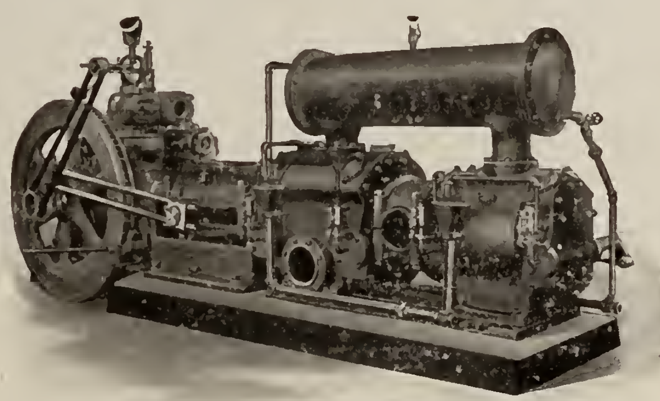

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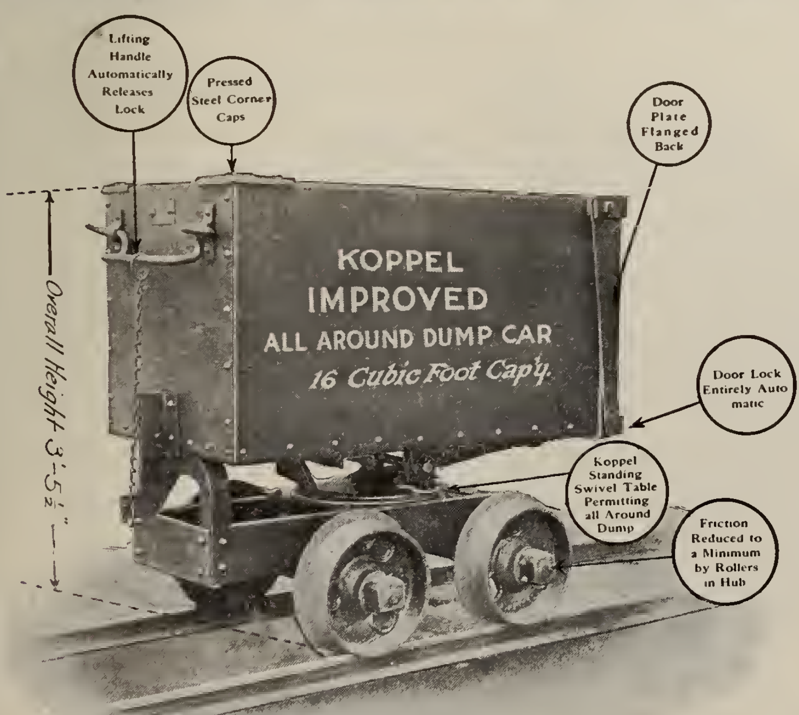


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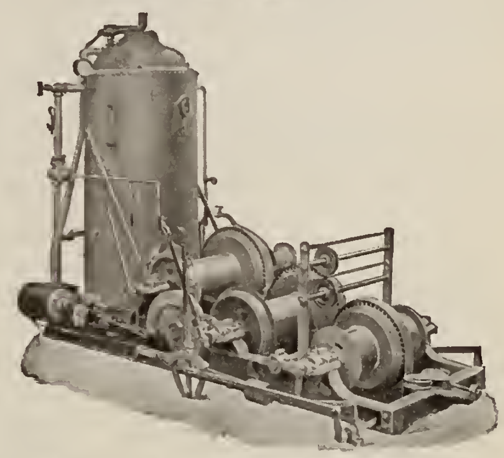

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# The Canadian Mining Journal

VOL. XXXIV. TORONTO, December 1, 1913. No. 23

## The Canadian Mining Journal

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REGINALD E. HORE

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CONTENTS.



## SUDBURY, COBALT AND PORCUPINE

In this issue, Mr. A. G. Charleton writes on the three most prominent mining districts in Ontario, which he visited during the past summer.

This article is reproduced by kind permission of the "Financial Times" from a series of articles by A. G. Charleton, Sept. 15, 27, 29 and Oct. 6.

Mr. Charleton, who is a past president of the Institution of Mining and Metallurgy, visited Canada to attend the twelfth session of the International Geological Congress. He was a member of one of the excellently planned and carried out excursions to Northern Ontario mining districts. In letters to the Financial Times he pays fitting tribute to the Ontario Bureau of Mines and to W. G. Miller, the leader of the excursion, A. P. Coleman guide for the Sudbury district, C. W. Knight, A. G. Burrows, and P. E. Hopkins, who acted as guides in the Cobalt and Porcupine Districts, W. R. Rogers the secretary of the excursion, A. A. Cole. mining engineer of the Timiskaming and Northern Ontario Railway, and to many others to whom the success of the excursion was largely due.

Mr. Charleton was 30 years ago resident in Canada at Deloro, Ontario, where he was assistant manager of the Canadian Consolidated Gold Mines. After a long absence he found on his visit this year a startling improvement in the mining industry. On his return to England he contributed several articles on the mines of Ontario to the columns of the Financial Times. In this issue we present several extracts from these articles, together with a number of photographs, most of which were taken during the summer at the mines visited by the excursion of which Mr. Charleton was a member.

## ANNUAL REPORT OF T. W. GIBSON, DEPUTY MINISTER OF MINES, ONT.

The annual review of mining in Ontario, written by Mr. Gibson, and published in the reports of the Bureau of Mines, is one of the best reports issued by mining bureaus.

It is an accurate summary of mining activities. Statistics of production of the several metals and non-metals are presented in an interesting manner, and are, owing to the reliable information furnished by the mining companies under the act, to be considered as the final figures. The figures for production are for metal actually recovered, not for total metal contained in the ores.

In this issue we publish several pages from Mr. Gibson's report. The complete text can be obtained on application to the Department of Mines at Toronto.

## METAL MINING IN ONTARIO

Metal mining has become a great industry in Ontario. Gold, silver, nickel and copper are produced in large quantities.

For some years the nickel-copper mines of the Sudbury district have been widely known as the world's chief source of nickel and important producers of copper. The output this year is greater than ever.

Since the original discovery ten years ago the silver mines at Cobalt have placed Ontario in a prominent position as a producer of silver. The deposits are remarkably rich and the profit has been unusually large, amounting to about one-half of the value of the silver. The production is now at the rate of over 30,000,000 ounces per year. For this year to date there is a slight increase over last year both in quantity and in value.

Until quite recently Ontario had few successful gold mines. The discovery of gold in the Porcupine district, however, has resulted in the development of two large and profitable mines. A third, though small, is proving rich and there are others which, while so far not profitable, are looked upon as likely to become so.

There are many miles of territory in Northern Ontario concerning which scarcely anything is known. There are large areas which have been described by explorers as promising; but as yet unprospected.

There is every indication that many more important ore deposits will be found in the Province and that the mining industry will continue to grow.

## AGREEMENT BETWEEN DOMINION COAL COMPANY AND PROVINCIAL WORKMEN'S ASSOCIATION

The agreement covering wages and conditions of work between the Provincial Workmen's Association and the Dominion Coal Company which expires 31st December, 1913, has been once more renewed for a period of three years ending 31st December, 1916. The document on which this agreement was endorsed is now of almost historic importance. It is the original signed award of the Shortt Board of Conciliation, given in March, 1908, which was at that time accepted by the Coal Company and their workmen as the basis of a two years agreement ending 31st December, 1909. The agreement was renewed for a further period of two years ending 1911, and once again for two years ending 1913, and upon the present and last occasion for three years ending 1916. The successive renewals of the award are endorsed upon the original document, which has now become an interesting record of the permanence of the harmonious relations existing between the Dominion Coal Company and their workmen at the mines.

The new agreement continues in force the rate of wages and the conditions of work in existence at the end of 1913, together with an increase of six per cent. to all day-paid labourers in and about the mines whose rates at the end of 1913 were less than $2.00 per day, together with sundry local increases in contract rates to meet special local conditions. In 1907 the rate for common labour was $1.38 per day. This rate was raised to $1.45 in 1908, again to $1.52 in 1910, to $1.60 in 1912, and from 1st January, 1914, will be $1.70 per day. The rate for shiftmen, which has been $1.75 per day since 1908, is raised to $1.85 per day. As previously stated, all day-paid men rated under $2.00 per day will receive the six per cent. increase.

The satisfactory conclusion of the negotiations between the Coal Company and the P. W. A., and the extension of the agreement for another three years, has caused general satisfaction throughout the whole district. On one side it will enable the company to make sales contracts and lay out a programme of development without any fear of labour troubles interfering with their plans, and on the other side, it assures to the workmen a continuance of their present earnings, plus as great an increase as the industry can properly afford. It is the record of the relations between the Dominion Coal Company and the P. W. A. that these have never yet been interrupted by a serious strike, and yet since 1900 the P. W. A. have obtained a continuous series of increases in wages, all of which have been obtained by the same method of negotiating and bargaining and eventual mutual agreement, which the latest contract perpetuates for a further three years. It is hardly necessary to set forth the merits of this constructive and conserving policy as against the destructive and wasteful methods of those who for their own ends caused the deplorable strikes in 1909 and 1910 in the various coalfields of Nova Scotia.

## WORKMEN'S COMPENSATION

The Province of Ontario expects soon to have a new Compensation Act. Sir Wm. R. Meredith, Chief Justice of Ontario, and Special Commissioner of the Ontario Government on Workmen's Compensation, has drafted a bill for submission to the Provincial Legislature. It is proposed, among other things, that compensation last as long as the disability; that employers must contribute towards the expense of administration; that the Provincial Government will contribute to the fund; that contributary negligence is no bar to compensation; that the common law by which an employee takes upon himself risks incidental to his employment be abrogated; that wilful or serious misconduct shall be cause for declining compensation unless death or serious disability results.

Apparently there is no clause requiring that the employee contribute in some small way to the fund. Managers would like to see such a clause, not merely because the workers would be paying a share of the cost of accidents; but because the workers would then have a good reason for striving with the managers in an attempt to prevent accidents. An assessment, even a very small one, would be unwelcome to the worker. He could be expected to strive to keep it as small as possible. In doing this he would go out of his way to prevent accidents to himself and his fellow workers.

# THE DEVELOPMENT OF NORTHERN ONTARIO BY THE MINING INDUSTRY

By J. C. Ross, Editor Journal of Commerce.

It is a far cry from the struggling uncertain days of the Cobalt of 1905 and 1906 to the Cobalt of to-day. In the few years that Cobalt has been in existence, it has made good. The hundreds of mines, prospects and claims have dwindled to a score or more of carefully managed, dividend-paying properties. To date, Cobalt has produced upwards of $100,000,000 in silver and paid back to shareholders almost $50,000,000 in dividends. From the small district known as the Cobalt Area, mining activity has extended until to-day Porcupine, Gowganda and a number of other places far removed from Cobalt, give evidence of a great mineralized Hinterland.

Up to a few years ago, Ontario was regarded as an agricultural province. Some attention was paid to lumbering and to fishing, but the great basic industry was farming. It was with the idea of extending the farming area and tapping the great Clay Belt of Northern Ontario that the Government commenced the construction of the Timiskaming and Northern Ontario Railway. While constructing this road, one of the employees, a blacksmith named La Rose, discovered what proved to be silver about one hundred miles from North Bay. This later became the La Rose mine and the centre of the Cobalt camp. The discovery of silver was followed a few years later by the discovery of gold at Larder Lake, Swastika and Porcupine, and other places, and silver at Gowganda, South Lorrain, and Montreal River. The discoveries of these mineral areas added a new basic industry to agriculture, lumbering and fishing. In the decade from 1902 to 1912, the mineral production in Ontario increased from $13,000,000 to $47,471,000. Last year, the silver produced in Canada, which is practically all from Northern Ontario, amounted to $19,425,000. The value of the Canadian nickel—also a Northern Ontario product—was $13,452,000. The value of the gold produced in Northern Ontario was $1,788,000. To-day, there are over 11,000 men engaged in metal mining in Northern Ontario who receive in wages an average of about $800 per year. The amount of ore shipped out, the freight furnished the railroads, the establishment of smelters, concentrators and other features associated with mining, have all tended to make Northern Ontario an important factor in the economic and industrial life of the Province.

From an investment standpoint, Cobalt has been the surprise of the world. In the early days when veins were found on the surface and outcroppings occurred in the most unexpected places, the impression prevailed that this was but a surface camp and that it would not maintain values at depth. After several years of mining, many of the companies are yet making important discoveries on their properties. Altogether, Cobalt has paid out in dividends almost $50,000,000. Nipissing alone has returned to shareholders over $10,000,000, while Crown Reserve, Coniagas, Kerr Lake and La Rose have paid in the neighbourhood of $5,000,000, and several others have paid out over $1,000,000 in dividends. There has been taken out of the Cobalt camp over $100,000,000 worth of silver, making it one of the most important silver producing areas in the world.

Farther north, Porcupine is making a very creditable showing as a gold producing district. Hollinger, the most important mine, has paid out over $1,000,000 in dividends during the past year. Other gold mines in the Porcupine district are making satisfactory progress, although expenses connected with the mining and milling of the ore are so heavy that it takes time to achieve results. Gowganda is looked upon by many mining experts as a promising district, but owing to the fact that this section has been without roads, development has been exceedingly slow. Some companies have found very valuable ore and it will only be a question of time until Gowganda becomes a heavy producer.

There is no reason to believe that the minerals of the North Land are confined to the three or four districts now being worked. Practically the same rock formation occurs throughout large areas of Ontario's Hinterland and traces of valuable minerals have been found in many outlying parts. Eventually the whole of Northern Ontario will become more or less of a mining district. As new railroads are built and the country opened up, areas, now inaccessible, will be more thoroughly explored and minerals found.

Metal mining in Ontario will doubtless continue to be an important industry. Any falling off in the production of minerals from the Cobalt and Porcupine districts will be offset by fresh discoveries in other parts of the Province. Already reports of new discoveries are being made in districts far removed from the present beaten tracks. Railroad development will doubtless open up many new mineralized areas. It was the construction of the Canadian Pacific Railway that gave us Sudbury with its nickel and copper mines. The building of the Algoma Central gave us the Helen mine, while other discoveries around the Lake of the Woods, Michipicoten, Seine River, Bruce Mines and many other parts of the country, as well as the great discovery of the Cobalt and Porcupine camps, have all been the result of railway construction. To-day, the National Trans-Continental Railway across Northern Ontario is nearing completion. Other roads are being projected through the new district of Patricia and other parts of Ontario's Hinterland. In a recent report, Thomas W. Gibson, of the Bureau of Mines, says: "The only key to the future is found in the past, and in the vast area of pre-Cambrian rocks yet unprospected in Northern Ontario—to which was added the principality of Patricia—it can hardly be doubted that many more deposits of mineral wealth will be found."

Any mining district which, in the course of a half dozen years can produce $100,000,000 worth of silver and pay back to the stockholders $50,000,000 in dividends, cannot be ignored. Cobalt has added a new industry to the life of Ontario. It has created a market for the farmers of the great Clay Belt. It has attracted the world's attention to the Ontario Hinterland and advertised it more quickly and thoroughly than would have been possible by years of ordinary advertising. It has attracted immense sums of money to itself and kindred industries in the Dominion. It has furnished traffic for the Government railway and made what was once regarded as a foolish venture a profitable enterprise. Ontario and Canada owe much in an industrial and economic sense to the mineralized area known as the Cobalt and Porcupine districts.

## MINING EXHIBITS AT PANAMA-PACIFIC EXPOSITION.

At the Panama-Pacific International Exposition to be held in San Francisco in 1915 there will be an impressive display of the mining industry. Charles E. van Barneveld, chief of the Exposition's Department of Mines and Metallurgy, is making every effort to gather under the roof of the great palace that will house the mining and metallurgic display a collection of object lessons that will show the mineral resources of every country and the methods of extracting them from the earth. The display will be a liberal education in the science of mining.

"It has been said that mining operations do not lend themselves readily to exhibition," said Chief van Barneveld recently, when questioned as to the difficulties that might be expected in his undertaking, "and that the legitimate mine-operator has little commercial incentive to exhibit because he has nothing to advertise, nothing to sell. Fortunately, the mining industry in the main is in the hands of public-spirited men, accustomed to taking a large view of things, men who will not allow the lack of commercial incentive, the lack of apparent direct individual benefit, to outweigh the decided indirect, collective benefits to be derived from the right sort of publicity. We hear much of the decadence of prospecting and mining, of the lack of security and stability of mining investments. The miner has suffered greatly from misunderstanding, from public ignorance, and, above all, from persistent misrepresentation. We all recognize, in a general way, the importance of education; it is the greatest remedy for prejudice, superstition and ignorance; it makes for greater all-round efficiency. A well planned exposition is of incalculable value as an educator of the public mind. Many important questions in which the miner is vitally interested are pressing for settlement. When not blinded by prejudice and ignorance, the public is essentially fair-minded; it only needs education. This exposition offers to the men at the head of the mining industry an opportunity which probably will not recur for a decade, to give the public an insight into the importance, the stability and the solidarity of the industry, its legitimate speculative and investment features, the need of capital, of fair treatment, of wise legislation, of public support and co-operation. Surely this is sufficient commercial incentive."

## CHISANA GOLD FIELD, ALASKA.

The following information relative to the Chisana or Shushanna gold field, Alaska, was recently printed in Vancouver, B.C.:

Extensive development work is to be carried on during the coming winter in the Chisana diggings, according to Capt. W. Turnbull, who operates a steamer for the White Pass & Yukon route between Whitehorse and Dawson, and has just come down to Vancouver from the Yukon. He said there are 700 men in the camp awaiting "freeze-up" in order to start operations.

Capt. Turnbull is interested in two claims in the new gold fields, and intends to spend the winter there. He is going into the camp shortly with a large consignment of supplies for the W. P. & Y. R. The transportation company is operating a regular service into the diggings, and has already taken in a large store of supplies for the winter trade.

Reference was made to the fact that several prospectors had recently returned from the north, and had declared the discovery to be greatly over-estimated, and the captain was asked for his opinion on the prospects.

"A lot of prospectors went into the camp without reserve supplies," he commented, "and, consequently, could not stay there very long, as there were few stores up there in the summer. Many of the gold-seekers never reached the diggings at all, as they hit the trail without adequate provision for the long trip. Conditions are different now since the transportation companies have been getting busy—there are ample supplies in the camp and the 'mush' can be made with light packs.

"A large number of prospectors intend going in this winter," he continued. "Many of the claims which were staked early in the rush will be available for relocating on January 1, as the required amount of development work has not been done on them."

Navigation has been closed up north. The last boat from Carcross left for Atlin on October 28. The last trip on the Whitehorse-Dawson route was made on October 22.

## WEST KOOTENAY POWER & LIGHT CO.

The West Kootenay Power & Light Co., which owns hydro-electric power stations at Upper and Lower Bonnington Falls, on Kootenay River, 11 miles below Nelson, and near Cascade City, on Kettle River, Boundary District, and which supplies electric power to the larger mines and the several smelting works at Trail and Rossland and in the Boundary, recently held its adjourned annual meeting at Montreal, Quebec. Statements of accounts submitted showed that last year's gross receipts were \$415,413, an increase of \$82,549, while operating expenses were \$115,279, an increase of only \$5,022. Net profit for the year was \$300,134, which was an increase of \$77,527, as compared with the immediately preceding year. After paying dividends on preferred and common stock and providing for sinking fund in connection with the Cascade Co.'s bonds, a balance of \$74,919 was carried to credit of profit and loss account, which now stands credit \$248,473. The directors were re-elected with the addition of T. J. Shaughnessy to fill the vacancy caused by the death of W. M. Doull, of Montreal, late president. Chas. R. Hosmer, who succeeded Mr. Doull as president, was re-appointed to that office.

## GRANBY CO. BOUGHT ALASKA MINE.

The Spokesman-Review, Spokane, Washington, in which city the Granby Consolidated Mining, Smelting & Power Co. has for years had its general manager's office, recently published the following:

The Granby Consolidated Mining, Smelting & Power Co., with mines at Phoenix and Hidden Creek, B.C., a smelter at Grand Forks, B.C., and another under construction at Hidden Creek, which will be ready to be operated about the first of the year, has purchased the Midas mine, near Valdez, regarded as one of the most promising copper deposits in Alaska, and development is now under way, according to reports received from the Granby offices in New York. The consideration is not made public, but it is reported to be about \$250,000.

An electric haulage system is being installed at the Midas, together with necessary mining equipment, and it is planned to have the mine producing by July or August, 1914. Already approximately \$1,500,000 of ore has been blocked out, assays from which show value averaging better than 5 per cent. copper and several dollars in gold. Granby's present plans provide for an ore storage at tidewater near the Midas and the output is to be treated at Hidden Creek. It is said the company contemplates eventually arranging for a line of steamers to transport the ore to the smelter.

# MINING IN NORTHERN ONTARIO*

By A. G. Charleton, M. Inst. M.M., A.R.S.M.

The twelfth International Geological Congress, recently held in Toronto, Canada, which I had the privilege of attending as one of the delegates of the Institution of Mining and Metallurgy, was a remarkable gathering and proved an immense success.

It brought together geologists from all parts of the world; men of international reputation drawn from every civilized nation familiar with the geological conditions and mineral deposits of almost every habitable portion of the globe thus far explored and surveyed. The delegates of the Congress numbered close upon 500, and 23 tongues were spoken, although but three languages were officially recognized, namely, English, French, and German, in any of which addresses might be delivered. The members of the Congress formed a splendid body of alert, keen men; every type of brain was represented, long heads and round heads, but most of them possessing the clear, far-sighted eyes which generally distinguish men trained in science; whilst most of the members were endowed as well with that fine physique which can only be gained by a life largely spent out of doors, in striking contrast to men condemned to work all their lives confined in stuffy offices, studies and laboratories.

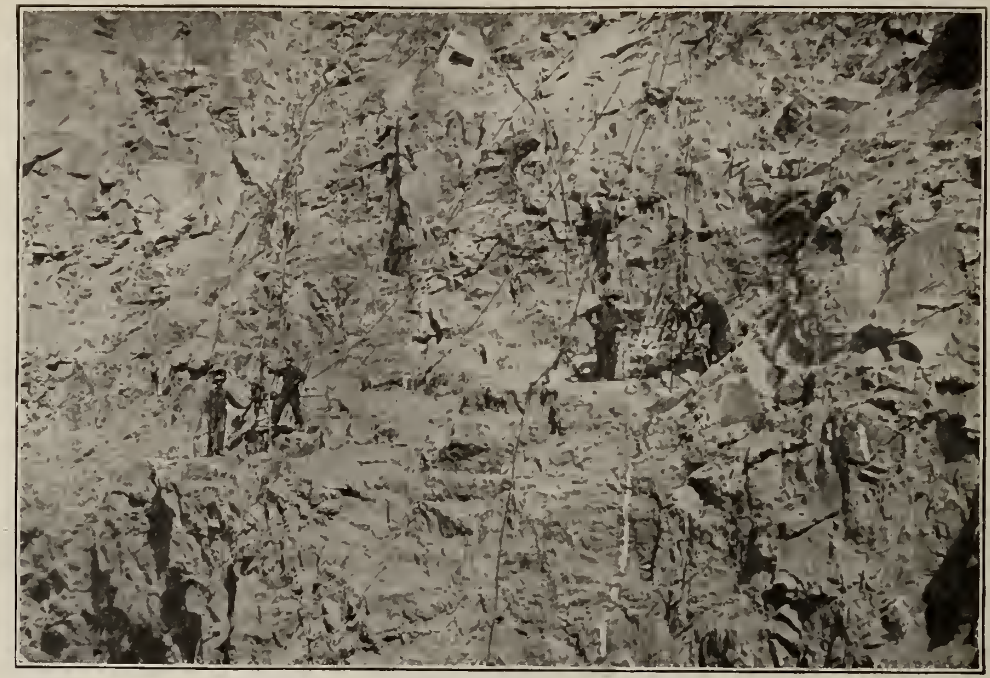
Breaking down nickel-copper ore, Creighton mine, Ont.

The Congress took place in Canada this year on the invitation of the Canadian Government, and although its proceedings proper are now over a number of the delegates have remained in Canada and are taking advantage of the specially arranged excursions, some of which are not expected to return to Toronto before the end of October. As has been well observed, these international meetings serve in a sense as "an international clearing house for geology," whilst, moreover, they focus attention upon the countries in which they are held, thus tending to aid in their development and promote their prosperity. The immense economic value of geological research is now widely appreciated in its application to mining, civil and other branches of engineering, as well as in connection with industrial enterprises, and questions constantly arise, not only in the investigations of ore deposits, but in matters of water supply and the foundations of structures, road construction, etc., upon which geology bears.

It is officially stated that over 40 per cent. of the mineral production of Canada is furnished by Ontario, and Northern Ontario possesses in Cobalt one of the most remarkable and productive silver fields, and in Sudbury the most valuable nickel mines in the world. An official excursion in which I took part afforded an opportunity for members of the Geological Congress to visit Sudbury, Cobalt and Porcupine. Sudbury lies about 35 miles north of Georgian Bay, the northeastern part of Lake Huron. It may be said to be a place of international importance, because it is the chief source of the world's supply of nickel, which is extensively used in steel armour-plate, for ordnance and other purposes in arts and crafts. New Caledonia is the only other locality from which any very considerable supplies are at present obtained. The geological features and the character of the ores of these two localities are, however, entirely different.

**The Sudbury deposits** were first worked in 1887 by the Canadian Copper Company, and difficulties experienced in treating the ore for copper led to the discovery that it contained nickel. The early difficulties in separating the two metals were speedily overcome, but a more serious problem then presented itself, namely, to find a ready market for the large quantity of nickel available. Fortunately, about 1890, the valuable properties of nickel-steel began to be appreciated, and the industry became firmly established, larger profits resulting from the nickel in the Sudbury ores than from the copper it contained, and of late years nickel mining has become exceedingly profitable and has been conducted upon a very large scale.

*Extracts from articles published in the Financial Times, London. Photographs by Reginald E. Hore.



Creighton nickel-copper mine, Ont.

The chief nickel-producing companies operating in the district during the past year were the Canadian Copper Company (controlled by the International Nickel Company) and the Mond Nickel Corporation. The formation of a new development company, the Canadian Nickel Corporation, Ltd., capitalized, it is reported, at $30,000,000, has quite recently been announced.

**The Sudbury ores** are not by any means of a complex character. They consist mainly of an intimate admixture of pyrrhotite, pentlandite and chalcopyrite in amorphous forms, but native gold, silver, platinum and palladium are occasionally found in them as well in appreciable quantities. The generally accepted theory of the origin of the ore bodies at Sudbury is that they are due to "magmatic segregation"—that is to say, the molten mass of eruptive norite was charged with the sulphides of iron, nickel and copper, which separated out before cooling completely; and it is a remarkable fact that nickel ore bodies are also found associated with norite in Norway. Some observers hold the view that the ores have been deposited by the agency of water replacing the original constituent rock minerals. But the weight of evidence seems to be in favour of the first-named theory, which does not deny that there may have been subsequent rearrangement of some of the minerals present by water agency, which is quite probable.

The ore bodies of Sudbury are of several distinct types. 1. "Marginal," (a) dipping towards the axis of the basin consisting of ores with comparatively little rock and more than twice as much nickel as copper. (b) "Faulted marginal," irregular in shape and character—usually mixed with much rock and carrying as much copper as nickel, or sometimes more. 2. "Offsets," (a) columnar, roughly cylindrical bodies, nearly vertical, and going to great depths, usually rich in copper and the precious metals. (b) "Parallel offsets," not columnar, but sheet-like, dipping towards the basic edge, and carrying ore of a similar character to the "marginal deposits." Pentlandite and pyrrhotite form the major portion of the ore-bodies, intimately admixed with each other and with chalcopyrite. The latter mineral, while almost always present is more

Murray nickel-copper mine, Ont.

**Looking along outcrop of ore body, No. 3 mine, Canadian Copper Co., Ont.**

often found in pure masses, small in size, but free from the other minerals. Occasionally some very rich "patches" of ore have been found carrying some of the rare and precious metals, and in the early days several thousand dollars' worth of gold were obtained by means of a three-stamp prospecting mill whilst sinking the shaft of the Vermilion mine.

**The Creighton mine** supplies a good example of a typical Sudbury ore, although the average nickel and copper contents naturally vary somewhat in different mines. The ore contains about 1½ per cent. copper and 4 per cent. nickel, or 38 parts Cu to 100 parts Ni. Near the east end of this mine a characteristic contact of norite with the older gneiss may be seen, and the huge "open-cast," 300 ft. deep, traversed below by underground workings, reached by means of an underlie shaft sunk near the edge of the pit, is a sight not to be forgotten, reminding one of some of the immense open-cast workings in the copper mines in the South of Spain. These open-cast workings are quite a feature of the Sudbury district. The members of the Geological Congress visited the Copper Cliff mine, one of the richest and most important of the early mines, which has now been abandoned. The ore body formed an irregular chimney, which has been followed for 1,300 ft. on an incline of 70 deg. to the east. The gossan-covered ridge at Frood, which was visited afterwards, is believed to contain the largest known nickel deposit in the world, estimated to contain between 35 and 100 million tons of ore. After testing it with diamond drills, the Canadian Copper Company has sunk two shafts and begun work on this deposit; and the Mond Nickel Company, which owns the "Frood Extension," taking in part of the centre of the ridge, is sinking a third shaft. At Murray, and in other parts of the field, explorations are in progress with diamond drills, and at Murray the nickel ore body is already known to reach a depth of 1,100 ft. and is estimated to include more than 10,000,000 tons.

And there are doubtless parts of the district, as yet unexplored, which will repay prospecting in this manner.

**Rock-house No. 3 mine, Canadian Copper Co., Ont.**

Canadian Copper Co.'s smelter at Copper Cliff, Ont.

### Treatment Method.

The general treatment of the Sudbury ores after hand sorting involves four distinct processes: (1) Roasting to remove part of the sulphur; (2) smelting in water-jacket furnaces, to produce furnace or standard matte; (3) re-smelting the standard matte in "converters," to enrich it up to 75 or 80 per cent. of nickel and copper; and (4) the separation and refining of the nickel and copper. Five companies at least, in addition to the Canadian Copper Company, have been engaged in the production of standard matte—the Drury Nickel Company, at the Chicago or Travers mine; the Mond Nickel Company, at Victoria mine (which possesses a remarkably fine plant), the Lake Superior Corporation, at Gertrude; the Vivians, at Murray mine; and the Dominion Mining Company, at Blezard mine—and their general method of treatment varies but little, though the size and equipment of the various plants differs enormously. Canadian matte from Copper Cliff is treated by special methods at Bayonne, N.J., by the international Nickel Company, whilst matte from the Victoria mine is treated by the Mond process at Clydach, Wales; the reduced metals being acted on in the Mond process by carbon monoxide, and the nickel separated from the copper as a volatile compound.

Norwegian matte, obtained from Norwegian ores, is treated differently, and separated electrolytically by the Hybinette process, at Kristiensand, Norway. There are, therefore, three absolutely different ways of separating nickel and copper from the high-grade matte, all of which seem to be commercially successful in a greater or less degree, and able to compete with one another and with the different process used in the treatment of New Caledonian ores.

The Canadian Copper Company possesses a large power plant at High Falls, on Spanish River, about 23 miles west of Copper Cliff Station, which is a splendid

Train of slag pots, Canadian Copper Co., Copper Cliff, Ont.

Pouring furnace matte into Converter, Canadian Copper Co.'s smelter

Views of basic converters, Canadian Copper Co., Copper Cliff

New smelter of Mond Nickel Co., Coniston, Ont.

**Charging a basic converter, at new smelter of Mond Nickel Co., at Coniston, Ont.**

installation. The smelter sub-station—the main distributing point of the system—supplies motors in the building itself and elsewhere, having a total capacity of 7,700 horse power, besides arc and incandescent lighting for the smelter, shops, etc., and the town of Copper Cliff. The Mond Nickel Company has hitherto smelted its ores at its works near the Victoria mines. Recently, however, new works have been erected at Coniston, near the crossing of the Canadian Pacific and Canadian Northern Railways, and the new smelters there when entirely completed will be a modern and magnificent plant. They are near the company's mine at Garson, from which the bulk of its ore is now obtained.

**Nickel steel**, possessing as it does both the qualities of strength and lightness, has afforded an opening for the use of large quantities of nickel, in the development of the automobile industry, flying machines, etc. A chrome-nickel steel made from Mayari ore, obtained from the Island of Cuba, is claimed to possess a greater tensile strength of 8,000 to 10,000 lbs. per square inch and a higher elastic limit in the rolled-forged condition than carbon steel of the same carbon contents. Other nickel alloys, such as "Monel" metal, have attracted attention and come into use for various purposes, and the future of the metal, and, consequently, the future of Sudbury, looks extremely bright. The nickel district of Sudbury has been geologically examined most minutely, and its many interesting features have been most carefully and graphically described by Dr. A. P. Coleman, Professor of Geology at Toronto University, who was one of the guides of our party.

### Cobalt Silver Mines.

The Cobalt camp is situated about 90 miles northeast of Sudbury, and it is remarkable that copper and nickel are found so closely associated in the latter district, occasionally carrying a considerable amount of gold, with but little silver, whilst in the Cobalt field silver in large amount is associated with cobalt, nickel and arsenic, with but little gold present at any time. It was some time before the importance of the Cobalt discoveries were recognized. The district was, in fact, condemned by engineers in the early days, who failed to appreciate its immense value, and, although it seems unlikely that mining will be carried on there to great depths, as in some other fields, this is compensated for in other ways.

The attitude of those who condemned the district at first was doubtless largely owing to the fact that the individual veins of rich ore are narrow, averaging not more than 4 ins. in width, which would be apt to prejudice many engineers, whose training naturally and very properly makes them liberal in their ideas, but cautious and conservative in business matters, and they argued from experience in other cases of a different kind that these narrow veins would speedily cut out. A good illustration that whilst it is frequently the case that men err on the side of undue optimism, they also sometimes miss good business opportunities through ultra-conservatism—in fact, you cannot divest mining of a speculative element, and it would be a dull and poor business if entirely robbed of its romance. The history of Cobalt has been peculiarly romantic. The large number of veins and their extreme richness, as the event has proved, has fortunately compensated for their small width, and sometimes several parallel veins and veinlets ramifying through the wall rocks give a considerable width of concentrating and rich ore, so that stopes are carried to a width of 25 ft. or perhaps more, and individual rich veins may carry 2 or 3 ft. of milling ore on either side of them.

In the early days Cobalt was a poor man's camp, and it was due to the enterprise and pluck of "the prospector" that it has acquired its world-wide renown. One of the earliest "adventures" is said to have extracted ore to the approximate value of $250,000 at a total cost of $2,500, and statistics, I believe, show that the dividends distributed by the mines represent over 50 per cent. of the value of the output of Cobalt.

Fortune, therefore, in this case has been on the side of the optimist and of far-sighted geologists like Dr. Willet Miller, Arthur A. Cole and others, whose confidence in the future of the district has been justified, and has led to its being opened up upon its present scale.

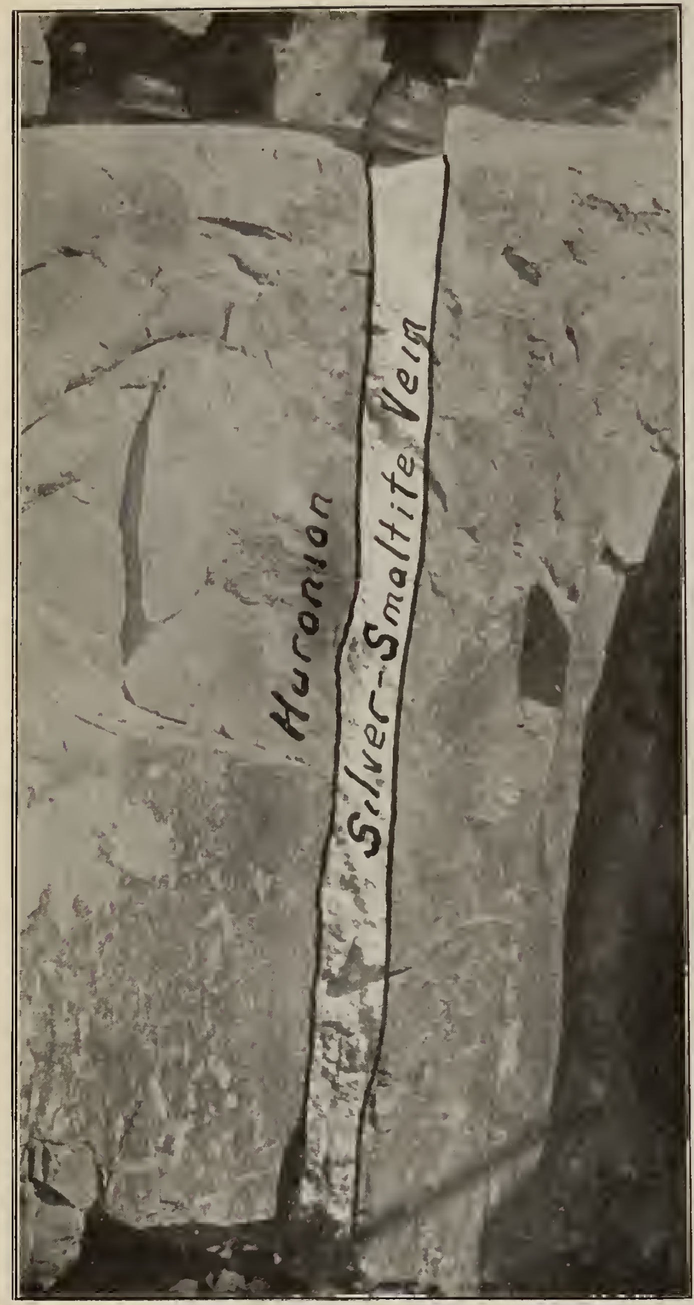
A view of Cobalt from Nipissing Hill

### The Rapid Rise of the Cobalt Field.

The output of Cobalt in 1904, it appears, only amounted to 158 tons of ore, worth $136,217, averaging 1,309 ozs. of silver per ton, or 5.34 per cent.; cobalt, 10.21 per cent.; nickel, 8.86 per cent.; and arsenic, 45.56 per cent. To-day Cobalt is the greatest silver producer of any single field to the extent, it is said, of about 13 per cent. of the world's entire production, whilst the white arsenic produced from cobalt ores is estimated at 20 per cent. of its total output. The silver output for 1912 is given as 22,393 tons of ore, valued at $17,455,080, and 5,449,732 ozs. of bullion, worth $3,338,106, or a combined value of $20,893,186—that is, well over £4,150,000. Upon the present basis of production a rise of 1 cent per ounce in the yearly average price of silver is calculated to increase the income of the producing mines by $300,000. In 1912 the largest shipments of ore (2,000-lb. tons) were made from the following seven mines: La Rose, 3,511; McKinley-Darragh, 2,673; Coniagas, 2,119; Cobalt, Townsite, 1,944; Nipissing, 1,869; Buffalo, 1,251; and Cobalt Lake, 1,085. The largest bullion shipments last year were from the Nipissing, 4,255,013 ozs., value $2,607,734; Crown Reserve, 346,234 ozs., value $210,634; O'Brien, 299,360 ozs., value $141,765; Buffalo, 205,302 ozs., value $124,895; and Kerr Lake, 171,645 ozs., value $104,420. At the commencement of 1912 there were twelve dividend-paying companies. The Cobalt Townsite and Cobalt Lake Companies have since entered the dividend-paying list. At the end of 1912 six companies had more than repaid their shareholders the amount of their capitalization—namely, the Crown Reserve had paid 275 per cent.; the Nipissing 161 per cent.; the Buffalo 156 per cent.; the Kerr Lake 144 per cent.; the McKinley-Darragh 126 per cent.; and Coniagas 107 per cent.; whilst the Trethewey had reached 96 per cent., and the Right of Way 77 per cent.

Cobalt proper covers an area of about six square miles in Coleman Township, but isolated mines have been found outside of the central group, such as Casey, 19 miles northeast of Cobalt; the Wettlaufer, 20 miles southeast; and the Mann claims and Miller-Lake O'Brien, at Gowganda, 50 miles northwest. The Elk

Washing rock surface to expose veins, Nipissing mine, Cobalt




Silver vein in Huronian Greywacke, La Rose Mine, Cobalt

Lake discoveries also lie in this direction. It is, therefore, reasonable to expect that important new discoveries are likely to be made in this vast area, which is approximately 5,000 square miles in extent, much of which has been very superficially, if at all, "prospected" or examined. Even in Cobalt itself, owing to the surface being covered with much timber and drift material, in the early days contacts and outcrops were concealed and difficult to locate.

The Nipissing is the largest property at Cobalt and has the largest output of any individual mine at present. Up to the end of 1912 it had produced no less than 27,741,248 ozs. of silver, from ore, two-thirds or more of which averaged 1,500 ozs. per ton. The proved reserves are estimated to contain nearly ten million ozs., and there is a large portion of the company's area still unexplored.

### Concentration of Low Grade Ores at Cobalt.

The richness of the ore in various mines is illustrated approximately by what it has cost to produce an ounce of silver. The cost in 1911, including mining and all other expenses, is stated to have been at the Kerr Lake 14.69, at the Nipissing 13.95, at the Crown Reserve 10,761 and at the Coniagas 8.8 cents per ounce. There are several "Custom," as well as a number of company mills at Cobalt, and the only mill idle in the camp in 1912 was the Silver Cliff, which was reopened early this year. The concentration of low grade ores at Cobalt is becoming a matter of greater importance each year. In 1912 a new record was reached, 455,516 tons having been treated at different mills, and with enlargements either planned or carried out is likely to show further substantial increases. The "flow sheets" of the different water concentration mills show considerable variation in treatment at the different mills and considerable variety in the machinery employed for the purpose, as well as in the manner in which it is arranged, the details of which cannot be gone into here. But it may be observed that the "concentration ratio" varies within very wide limits, namely, from 130 to 1 downwards to 22 to 1. The most recent and interesting metallurgical innovation at Cobalt is the employment of aluminum dust in place of zinc dust for the precipitation of silver from cyanide solution at the Nipissing mill. Including the necessary alkali, the cost of aluminum precipitation is probably 30 per cent. higher than zinc, but the higher class "precipitate" resulting and the recovery of cyanide seems likely to render its use advantageous.

The bulk of the ore shipments from Cobalt go for treatment to (1) the works of the Canadian Copper Company at Copper Cliff; (2) the Canadian Smelting and Refining Company at Orillia; (3) the Coniagas Reduction Company at Thorold; and (4) the Deloro Mining and Reduction Company at Marmora, all in Ontario.

Compressed air pipe line, Gillies Limit, Cobalt

There are, however, several other smaller buyers. The arsenic in the Cobalt ores is a valuable by-product, and so is the cobalt to a less extent.

From an engineering standpoint, the Taylor plant of the Cobalt Hydraulic Power Company on the Montreal River is a most remarkable installation. This is for the compression of air carried down by a large volume of water into a large tunnel, and in its descent of 351 ft. becomes a mixture of water and compressed air, which is liberated at the lower end of the tunnel 1,021 ft. in length.

In the tunnel the air is compressed to 125 lbs. and is said to be remarkably free from moisture. The machinery for the collection, measurement and distribution of the air is contained in quite a small building, and it is delivered to Cobalt through nine miles of 20-in. pipe, 7½ miles of 12-in. pipe, and nine miles of 6-in. and smaller sizes, and sold at 25 cents per 1,000 cubic feet at about 100 lbs. pressure and atmospheric temperature.

### Prospects of New Discoveries.

The value of the Cobalt veins is such that "intensive prospecting" is being carried on by the Nipissing Company on Nipissing Hill with a hydraulic monitor, which sweeps away the surface soil and lays bare the rock below, so that it can be closely examined for silver streaks no thicker than a knife blade. And, no doubt, important new discoveries will be made in the district from time to time by more thorough prospecting. People on the spot have a marvellous faith in mining at Cobalt. Large prices have, I believe, been paid in a number of cases for properties upon which little, if any, actual prospecting had been done; and important concessions have been taken up under the lakes merely upon geological probabilities, which have in some instances certainly repaid these apparently highly speculative ventures.

### Porcupine Gold Mines.

My last excursion in connection with the International Geological Congress included a visit to the Porcupine gold field, which is situated on the Hudson Bay slope of Northern Ontario, close to the southern fringe of "the great clay belt," destined, it is believed, to become at some future time an important farming country. Porcupine lies 100 miles northwest of Cobalt, at an altitude of about 1,350 ft. above sea level. Little prospecting was done previous to 1909, when J. S. Wilson made a spectacular discovery of gold on what is now the Dome property. The disastrous forest fires which broke out in the middle of May and lasted until the middle of July, 1911, unfortunately gave the district a serious setback, as they swept over South Porcupine and Pottsville and the northern part of Porcupine (Golden City), besides destroying a number of surface plants, and were attended by a very sad loss of life. But with undaunted courage and faith in the district the mine owners set about reconstructing the mills, and gold to the estimated value of about $1,800,000 was produced in 1912.

The two leading mines to-day are the Hollinger and the Dome. The outcrop of the first-named property is crossed by an old Hudson Bay trail, which scores of men must have traversed unsuspecting the wealth buried beneath their feet. Probably some of them camped on the very spot, where the main lode outcrops, where gold was afterwards discovered. The two premier mines differ, however, considerably in character, the Hollinger ore being comparatively rich and yielding a large profit per ton, whilst the Dome is a big deposit of ore of much lower grade on the whole. Other properties in the district include the McEnaney, Miller-Middleton and Dixon. In 1910 the ore treated at Porcupine only amounted to 1,060 tons, which yielded 1,947 ozs. of bullion, valued at $35,539, whilst in 1912 the production of the district had risen to 88,466 tons, which yielded 50,633 ozs. of bullion, valued at $1,032,313. The forest fires of 1911 destroyed the small experimental plants of the Dome, Hollinger and Vipond, but the new mills of these companies and of the McIntyre were in a position to treat the above-named tonnage in 1912, and the construction of two other mills, the Dome-Lake and McEnaney (Crown Reserve Mining

**Gold Quartz, Dome Mine, Porcupine, Ont.**

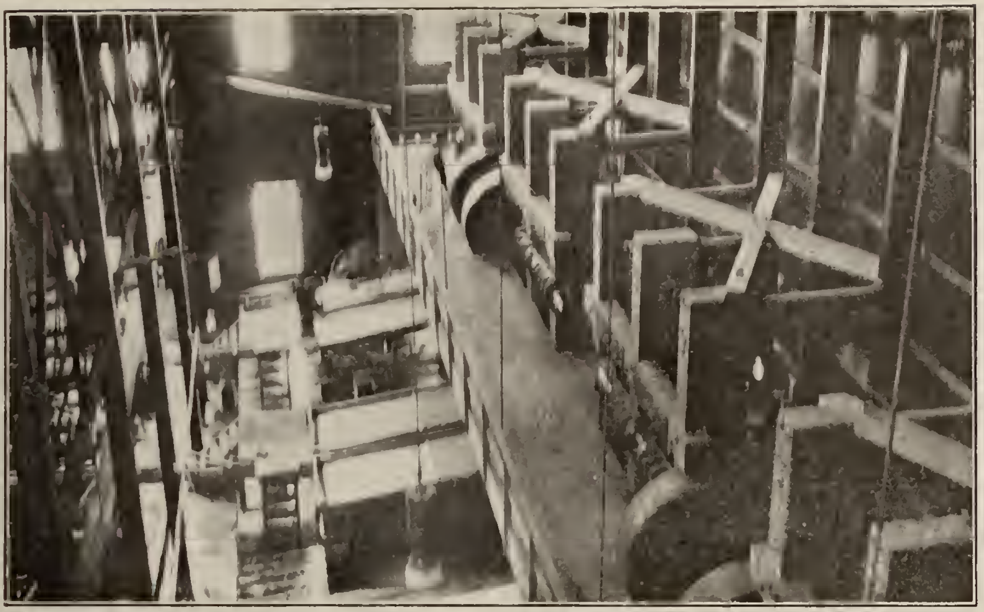
Gold quartz veins, Dome Mine, Porcupine, Ont.

Company) was also put in hand. With these mills in operation it appears reasonable to expect that the returns from this district in 1912 will be exceeded by its production in 1913.

### The Hollinger Mine.

At the Hollinger the ore reserves at the commencement of this year were estimated to amount to 644,540 tons, valued at $11,271,400, and the profit made during the last half of the year was $600,664.42. Up to the end of 1912 the company had paid three dividends of $90,000 each, bringing the total dividend distribution up to that date to $270,000. The reserves showed an estimated increase in value at the end of last year of $1,041,400, allowing for ore standing in reserve at the beginning of the year, to the value of $970,304.89, which was subsequently milled, and the mine at the end of 1912 had only been partially opened up to the comparatively shallow depth of the 300 ft. level. There are stated to be forty-three veins upon the property, of which seven were discovered in 1912, and upon thirty-four of them no work has been done beyond sampling the outcrops. The three principal veins opened up are known as No. 1, No. 2 and No. 4, which showed reserves estimated to be worth $6,026,100, $2,648,250 and $1,012,-

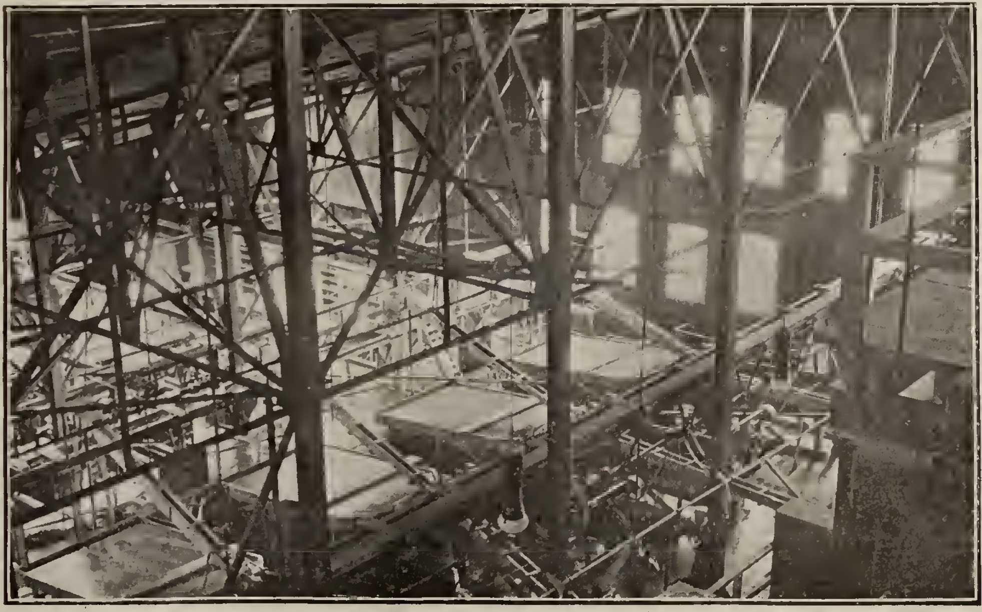
Mining gold quartz in open pit, Dome Mine, Porcupine



**The Dome stamp mill (in 1912)**

000 respectively at the commencement of 1913. But six other veins had been developed to some considerable extent, showing reserves varying in value from $33,200 up to $400,900 individually. The veins occur either in porphyry schist or near the contact, and development so far has been confined to veins in the porphyry. The strike of the schist is generally southwest to northeast, whilst the quartz veins cut across its strike at a small angle. No. 1 vein has a characteristic lenticular structure varying in width from 20 ft. down to a few feet, the lenses frequently overlapping. The average estimated value of all the ore treated in 1912 was $21.40 per ton, including low-grade ore sent to the mill at the start of milling operations and during the strike, but the average of all the ore won up to 5th October, 1912, is figured at $23.69 per ton and 5,777 tons of clean ore milled from the stopes yielded an average value of $37.89 per ton.

The mine costs at the Hollinger in February, 1913, exclusive of several items of extraordinary expenditure, chiefly attributable to the strike and alterations to the mill and plant, are stated to have been: Mining, $3,558; milling, $1.493; administration, etc., $0.407; operating camp, $0.261; general charges, $0.209; clearing surface roads, etc., $0.015; total $5.973 per ton of ore milled. But it is anticipated that, with uninterrupted work, the costs will be reduced approximately to $5.50 per ton. Directly and indirectly, the strike is said to have cost the company $100,000. The company employs about 500 men, and the working shifts are nine hours underground and eight hours on the surface. Skilled labour is paid $3.25 to $3.75 and unskilled labour $2.50 to $3.00 per day. Power is furnished from two independent sources at Mattagami River and Waiwaitan Falls. The new mill is said to be treating on an average 300 tons daily, with 30 stamps and making a 97 per cent. extrac-



**Dome Mill, Porcupine, Ont.**

Tube Mills, Hollinger gold mine, Porcupine, Ont.

tion from $30.00 ore. With 40 stamps in operation its capacity is calculated to reach 450 to 500 tons per diem, as the stamp duty may be reckoned at 12 tons per stamp using coarse screens. The machinery comprises a gyratory crusher of large size, with trommel, Blake crusher and belt conveyor, stamps with tube mills, Dorr classifiers and spitzkasten, Deister slime tables, Door thickeners, Moore filters, Merrill presses and other auxiliary cyanide plant, with bullion furnaces, etc., and preliminary amalgamation is dispensed with altogether.

### Conditions at the Dome.

At the Dome the ore bodies consist of veins and strings of quartz, much intermixed with schist, and the gold seems to occur along numerous small contact planes rather than in the quartz itself; very little sorting can, therefore, be done. Some rich specimen ore may be seen in the original discovery shaft a few feet from the surface at the end of a trench which follows along the back of a massive quartz outcrop. Two three-compartment shafts have been sunk—No. 1 to about 100 ft. in depth and No. 2 some 250 ft. or more—and the ore is carried from the mine to the mill by a double-tracked incline. The tonnage developed above the 45 ft. level is estimated at 315,528 tons, with a sampling value of $7.53 per ton. The new mill constructed after the fire of 1911 is stated to have treated from 23rd March, 1912, to 31st March, 1913, 101,812 tons of ore, which yielded $1,043,995, and its duty has been brought up to 425 tons or more by increasing the tube mill and filter press capacity of the plant. The crushing machinery comprises gyratory crushers (40 1,250 lbs.), stamps and tube mills, whilst the gold-saving appliances comprise Dorr classifiers, amalgamating plates, concentrating cones, Dorr thickeners, Pachuca and mechanical agitators, cyanide solution tanks, Merrill slime presses and bullion furnaces. The works of the company are to be entirely operated by electricity, supplied by the Northern Canada Power Company, generated at Waiwaitan Falls, in place of using coal. The cost of power supplied to the mines at Porcupine in this way is stated to be $50 per horse power per annum, calculated on peak-loads.

The different character of the two deposits makes the mining methods, as well as the mill practice, adopted at the Dome and Hollinger widely different. At the former mine most of the ore is won by the open-cast or "glory-hole" method, whilst at the latter mining is carried on either by ordinary stoping or by "shrinkage stoping" when the ore is wide (running as it does in No. 1 vein up to 20 ft. in width), and it is broken down in benches with long flat holes.

Pearl Lake, Porcupine, Ont.

A view from Tough-Oakes stamp mill towards Gull Lake. Tough-Oakes camp buildings in background

## Kirkland Lake District.

The writer, with several other members of the Porcupine excursion, made a branch visit to the Kirkland Lake district, in which several new discoveries were made last year. It is situated northeast of Swastika, which is about 61 miles north of Cobalt, on the Timiskaming and Northern Ontario Railway. Various gold claims have been opened up in this locality and one property, although only equipped with a small 5-stamp mill, is producing enough gold to pay running expenses. This claim is known as the Foster Tough-Oakes, and several veins have been located upon it. No. 2 vein is regarded as the principal one at present. It occurs in a grey and more or less banded conglomerate, a few feet north of the contact between the sedimentary series and grey feldspar prophyry. The conglomerate seems to dip nearly at the same angle as the vein. A main incline shaft was started from the bottom of an open cast about 30 ft. deep, and had reached a depth of 175 ft. on 28th July last. The principal quartz vein seen at the surface and in the shaft, although narrow, appears to be persistent as well as rich, and the wall rocks are said to carry good values for a width of several feet, payable across the full width of the shaft, and apparently over a width of 15 ft. or more at the bottom. Gold telluride (apparently "calaverite") was first noticed about 18 ft. from the surface, and is stated to have increased in quantity in depth, as the proportion of silver to gold has also done. Two early shipments of picked high-grade ore, won from the open cast, each of about twenty tons, returned 19.6 to 22.5 ozs. in gold and 23.4 to 33.6 ozs. silver per ton, and were valued at $9,235.60 and $8,567.36 respectively. The Burnside is another new discovery in the same locality, and other properties are being opened up between

Teck-Hughes gold mine, Kirkland Lake, Ont.

Swastika and Kirkland Lake, which was formerly rather inaccessible; but this will shortly be remedied by a new road, under construction by the Government.

**Gold Ore as received at stamp mill, Tough-Oakes mine, Kirkland Lake**

**Conclusion.**

Summing up, it is clear that Canada possesses in this little piece of Ontario alone, which the writer visited, immense deposits of mineral, comprising gold, silver, nickel, iron and other metals, that are being worked with large profit, and the old Hudson Bay territory to the north, which is as yet one of the almost unexplored corners of the globe, is said to be rich in copper and other deposits. Canada, it is true, cannot at the present time boast of many deep mines; but it is a mining country in the making, and the gross value of its metallic products alone came in 1912 to over $61,000,000, silver contributing $19,425,656, nickel $13,452,463, copper $12,709,311, and gold $12,559,443. Neither does the Dominion at present possess many large mines encompassed in a small area, like those of the Rand, Broken Hill, Kalgoorlie, Charters Towers and other places, if one excepts Sudbury and Cobalt. But there are numerous mines, more or less scattered over Ontario and the West, and as railways and roads are pushed out into new, unexplored districts, one can scarcely doubt that many important individual discoveries will be made, and probably large new mining camps will be opened up, which will vastly increase its mineral production in a few years' time, and place it in the front rank amongst other mineral-producing countries.

And this brings me to the vital question whether these vast territories, with their potential mineral wealth, will lie idle for a time or will be left entirely to American and Canadian capitalists to explore and develop, or whether in the future, as in the past, British capital and British brains will take an active interest and an active part in co-operating in this important, beneficent and Imperial work, or will they leave it to Empire builders possessing greater enterprise and greater foresight?

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**On the Porcupine winter trail in 1910**

# SAMPLING COBALT SILVER ORES

### Sampling High Grade in the Mines.

Owing to the richness and the irregularity of the distribution of silver in the veins, it has always proven difficult to get an accurate sample of an ore shoot at Cobalt. Some engineers have little faith in the samples however taken. Others believe that a reasonable approximation of value can be obtained; but that to do so the samples must be taken at very frequent intervals. In sampling along a drift at intervals of over 5 feet only a rough approximation is obtained. For a block sampled on all four sides it has been found that if the block is large—over 75x100 feet, a very inaccurate estimate is often obtained. For the smaller blocks it has been found that reasonably close approximation is possible; but that it cannot be considered a close estimate of contained values. Fortunately the latter is seldom necessary; but in many cases the mine managers have so little confidence in the regularity of ore shoots that they prefer to make no statement of the reserves blocked out. At some mines, however, the ore shoots are regular enough to allow reserves to be approximately estimated, and this is done by the managers in their annual reports.

### Sampling Low Grade in the Mines.

Most of the low grade ore that has so far been sent to the mills is ore that is broken along with high grade ore in following the veins. It is common practice to sample each breast, and to break as wide as the assays indicate the values to extend. It is usually the case that rock showing even occasional particles of native or ruby silver to the naked eye contains ore, and most of such material from the stopes is sent to the mill without assays being made. Where rock showing no visible silver is broken, a sample is sent to the assay office to determine whether it is ore or waste.

As much high grade ore had been removed before any attempt was made to treat low grade ore, the early workings on veins are now being extended to take out the milling ore. A large quantity of low grade is also being taken from the dumps where it was piled before concentrators were available.

In testing the walls of openings a common practice is to take the channel samples across the face at short intervals. At the Nipissing mine the walls are sampled by drill holes. In taking these samples, 6 holes are drilled horizontally from one set-up—3 holes in one wall opposite three in the other. The holes are placed in a vertical row and driven at right angles to the drift. The upper hole is 4.5 ft. deep, the middle 6 feet and the lower 3 feet. The hole is started with a diameter of 2½ inches, and a smaller size is drilled for each succeeding sample. When a depth of 18 inches has been drilled the holes are carefully cleaned out. The drillings give the first sample. Then another 18 inches is drilled and cleaned out, giving a second sample. This process is repeated every 18 inches, so that from upper holes there are taken three samples, from middle holes four samples, and from lower holes two samples. Where assays show good values for some distance in, the drilling is continued further.

The samples are all assayed and the results plotted. The construction of elaborate assay plans of the Nipissing property has thus been started.

In places where the samples show good values a further test will be made by breaking a sample for mill treatment. In doing this holes will be drilled at an angle with the holes made in sampling and the latter will then be used in breaking the ore. The assayed samples will thus be checked by a mill run before preparations are made for stoping on a large scale.

### Sampling Ore for Shipment.

By far the greater part of the silver shipped from Cobalt is in the form of ore or concentrates. There are large shipments of bullion from the Nipissing high grade plant and smaller ones from the cyanide plants treating low grade ore; but the camp is still largely dependent on the smelters. It is obviously necessary that an accurate sample must be made the basis for the sale of the ore.

The practice for some years was either to have the sampling done at the smelters in the presence of a representative of the seller, or to have the sampling done by independent assayers in the United States. Much of the ore has been sampled by Ledoux & Co., of New York.

To provide for accurate sampling of the ore at Cobalt, Messrs. Campbell and Deyell established a plant which has proven of great value to those who use it, and also, indirectly, to the other mines.

The plant and process of treatment have been recently described in a booklet issued by the owners. From this I will quote a few paragraphs describing the process and giving some notes on the characters of the ores that make sampling difficult. The accompanying figure gives the flow sheet. The authors of the booklet say:

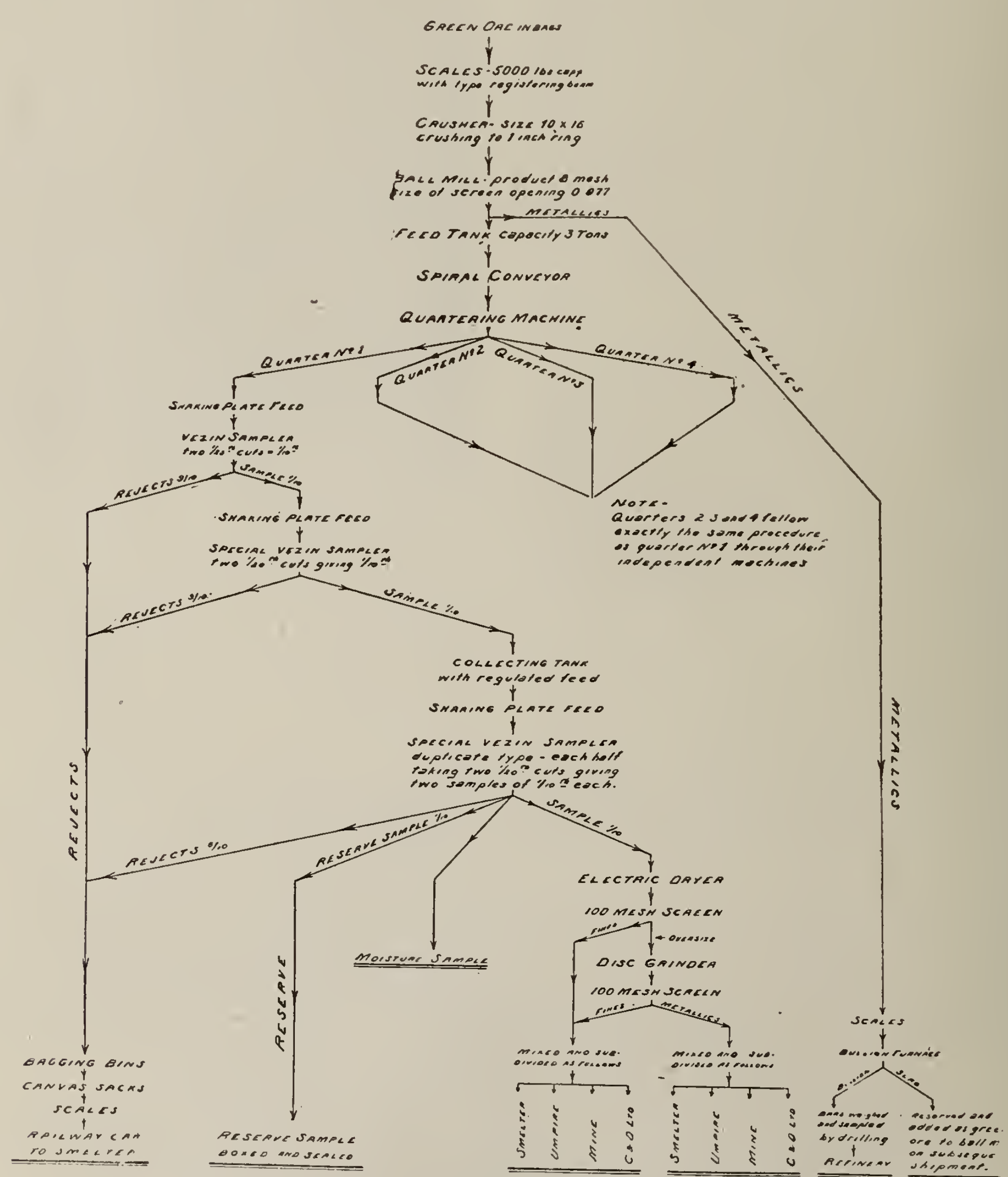
"The sampling of high-grade Cobalt ore for either of the purposes outlined presents some difficulties owing to its extreme variability, its richness, and to the presence of large and small nuggets and flakes called 'metallic silver.' In the reduction of the ore to suitable sizes for sampling by the ordinary method these pieces of metallic silver would be caught on the necessary succession of screens and would involve extremely laborious calculations throughout the process.

"To make our meaning more clear: In sampling a lot of ore composed of large pieces it is necessary in the first place only to crush to a size which will permit of thorough mixing and the extraction of a representative sample—say one-tenth. If this sample is still too large in bulk the pieces must be further crushed and mixed before another sample can be taken; and each extraction of samples must be paralleled by suitable crushing and mixing of the ore in this manner. In the Cobalt ores the pieces of metallic silver, being malleable will not crush, and consequently they must be screened off at each stage, weighed and the portion from which they were taken also weighed and finally the 'metallics' melted and their bearing on the rest of the ore-lot calculated separately by assay. This operation is necessary with each crushing, hence the laborious calculations as intimated above.

"However, by performing all the crushing in one or two consecutive operations at the very beginning the friable portion of the ore is reduced to fine powder and the uncrushable pieces of metallic silver are screened off for separate treatment, in one operation. The material passing through the screens is fairly homogeneous, and can be reduced, after mixing, to a very small representative sample before further treatment. The sampling of this ground product can be done entirely by machines—which have no personal equation—while the handling of the metallics and the finishing of the small samples can be closely supervised by the mine or smelter representative.

"It now is proposed to give in more or less detail a description of the method employed at Cobalt for the sampling of Cobalt ores, but before passing from generalities it might be well for us to express our opinion regarding the attitude from which sampling should be regarded.

"The bags are trammed from car or wagon into the mill, being weighed at the door on a Canadian Fairbanks type-registering scale. The car and ore-sacks are subsequently weighed and this tare deducted, giving the net green, or receiving weight of ore. The ore is either placed in locked bins, or, if to be sampled immediately, is carried by electric elevators to the second, or 'crusher' floor. Here the bags are opened and the ore shovelled over a one-inch grizzly, the oversize going to a 10-inch by 16-inch Buchanan crusher, which reduces it to 1½-inch ring.




**Flow Sheet of Campbell-Deyell Sampler**

"The company's chief works are situated in Cobalt immediately beside the line of the Timiskaming and Northern Ontario Railway, with a special siding leading to the mill entrance. From the mine, therefore, most of the ore is delivered to the plant in railroad cars, a certain proportion, however, being sent in by wagon. In all cases the ore is contained in jute or canvas sacks which weigh from 80 pounds to 150 pounds each.

"The discharge from both crusher and grizzly pass to a cylindrical steel tank with conical bottom, and is thence discharged automatically to the ball mill by an adaptation of the Challenge feed. The ball mill reduces the 1½-inch product continuously and passes it over a spiral screen (8-mesh), thereby discharging the 'throughs' into a steel hopper-bottom car and returning the over-size to be reground. Necessarily each lot of ore has to be crushed and sampled separately, and requires a complete clean up of the mill and the machinery after each lot has passed.

"After the ball mill receives the last portions of ore from the crusher tank, the presence of metallics becomes evident from the nature of the ball mill discharge. When it is adjusted that the metallics have been freed from the brittle ore and the mill is discharging a product composed mostly of pellets of silver, a section of the screen is removed allowing the metallics to be discharged in their unreduced form, into a suitable receptacle. These metallics are, at the discretion of the mining company, either bagged, weighed, and shipped to the smelter; or else they are taken to the bullion department and are there melted and cast into ingots. Samples are taken by drilling the ingots. It is usual to ship the bullion by express to the London or United States markets.

"To return to the No. 8 mesh product that has been discharged from the ball mill into hopper bottom cars; this is occasionally held in reserve in a steel hopper tank until required for further treatment; rarely it is bagged; usually the car is trammed, directly it is full, to the elevator, elevated to the top of the mill, and there discharged into the sampler feed-tank.

"From this point the ore is treated entirely by machines until four separate samples, of about 15 pounds each, are obtained.

"The sampler tank discharges its burden into a steel pipe fitted on the inside with a spiral band of steel. This spiral conveyor is rotated by a chain drive, the ore having the combined motion of advancing in the pipe and being tumbled over. This last motion, which gives a mixing action, while not equalizing the whole tenor on the ore passing through, cuts out the sharp lines of difference and enables the sampling machines following to have a uniform product discharged to them during each of their revolutions.

"From the spiral the stream of ore is fed by a spout to the quartering machine, which in each of its revolutions takes four equal sections of the ore stream. Each of these quarters is separately led by a pipe to a shaking plate, which equalizes the intermittent discharges and delivers a constant stream to the No. A Vezin sampler which takes a one-tenth cut from the stream (2 1-20 cuts per revolution). The reject falls directly by a pipe to the reject bin. The sample (1,500 pounds) is taken continuously by a second shaking plate and thence to No. B Vezin sampler, which, as before, takes one-tenth cut. The second reject is also led to the reject bin; and the sample (150 pounds) caught in a sealed sample safe. At the completion of the run all the machines are brushed down and the samples taken to No. C Duplicate Vezin Sampler.

"Here a shaking plate delivers a stream of ore to two double revolving vanes that extract, each, one-tenth sample (15 pounds) depositing each into a separate receptacle and the reject into a third. One 1/20 sample is boxed, sealed, and stored as a reserve; the other is taken to the finishing room; the reject goes to the bagging bin, or is held over until the next shipment from this particular mine, as are also the mill sweepings and the rejects from the finishing room. These operations are carried out with each of the four quarters from the quartering machine.

"From the bagging bin the ore is drawn off into canvas bags, which are tied, weighed, and shipped to the smelter.

"Up to this point the fine product from the ball mill has been automatically mixed, quartered and each of the quarters independently sampled by machines until eight samples of the lot (two from each quarter) are obtained.

"To follow the samples further; on reaching the finishing room the sample is weighed and dried in an electric oven for six hours at a temperature of 110 deg. C.; the moisture is thus incidentally ascertained —this method has been checked against the theoretical method with no practical difference resulting. The dried product is screened through a 100-mesh and the oversize ground in a Braun disc pulverizer to pass the same mesh.

"It is at this point that the metallic silver in the ore is again in evidence. The small pellets that pass through the ball mill screen are flattened out, or are rolled into spheres by the discs. These metallics, No. 2, are disced until clean as required, or are freed from impurities on the buckboard; the product from all operations either passing through the 100-mesh or being held on it as clean metallics. The metallics are mixed by coning on glass, divided into the requisite number of packets, and sealed. The fines are placed in an Abbe pebble mill, from which the pebbles have been removed, and the jar rotated slowly for half an hour. After mixing, the fines are carefully removed from the jar, placed on the glass table, flattened out with a spatula, and sections taken, packeted, and sealed for each of the parties interested.

"In this way, the ore after passing the ball mill screens is divided into four equal portions, each quarter after treatment resulting in a sample each of fines and metallics. The combined assay values of these two products give one valuation on the ball mill fines. The mean of the four samples is considered to be a fair valuation of this product.

"If now this number of ounces per ton is multiplied by the weight in tons of the ball mill fines, it gives the total silver content, in ounces, of this product. Adding to this the total fine ounces in the ingots obtained from the ball mill metallics, the total number of ounces in the shipment is arrived at. Multiplying this product by the current market price of silver gives the present value in silver of the shipment.

"The flow sheet will serve to give material aid to an appreciation of the above description. It shows in a graphic form every stage in the sampling of the ore.

"It must be understood that the foregoing is descriptive only of the method employed in dealing with high-grade Cobalt ore. As has been explained, there are certain difficulties in connection with Cobalt ores which call for more lengthy and elaborate treatment than is needful with many others. Still, as the greater includes the less, so this plant, equipped for this elaborate method, is capable of dealing, all the more readily, with less complicated processes."

## MANGANESE.

Ores of manganese found in Canada comprise pyrolusite, manganite, psilomelane and wad or bog manganese, and these are found principally in the eastern provinces of Nova Scotia and New Brunswick.

Mining operations have been conducted at Loch Lomond, Cape Breton, Tennycape, Walton and Cheverie in Hants County, East Onslow and Londonderry in Colchester County in Nova Scotia. In New Brunswick there are numerous occurrences and production has been obtained from Markhamville and Jordan Mountain in Kings County; Quaceo head, St. Johns County; Shepody Mountain and Dawson Settlement, Albert County.

# MINING IN ONTARIO IN 1912*

By Thomas W. Gibson, Deputy Minister of Mines.

The mining industry of Ontario continues to expand, not only in the quantity and value of the annual production, but also in the area embraced within its operations.

The beginnings of the industry were on the shore of Lake Erie, where a hundred years ago the settlers smelted the bog iron ores of the locality into stoves and potash kettles. In the eastern part of the Province the rocky areas proved to contain iron, gold, mica, and many other useful metallic and non-metallic minerals on which have been established industries of local, and in some cases more than local, importance. The shores of the great lakes, being accessible by water, lay open to the early prospectors, who were rewarded by the finding of copper at Bruce Mines, and silver at Silver Islet and on the mainland of Lake Superior.

The period of railway building set in, and wherever a pathway was opened in the forest, it became a base, sometimes indeed the actual site, of fresh discoveries. In a cut of the Canadian Pacific Railway, near Sudbury, in the year 1883, the first copper ores of that region were found, which soon proved to contain nickel, and so led to the opening up of the world's chief source of supply of that metal. The building of the C.P.R. enabled prospectors to ply their calling on Lake of the Woods and to penetrate to the valley of

**Mineral Production of Ontario, 1912.**

| Product. | Quantity. | Value. | Employees. | Wages. |
|---|---|---|---|---|
| **Metallic—** | | | | |
| Gold, ounces | *102,278 | $2,114,086 | 1,183 | $1,254,361 |
| Silver, ounces | †30,719,883 | 17,671,918 | 3,746 | 3,543,419 |
| Cobalt, tons | 936 | 315,781 | | |
| Copper, tons | 11,126 | 1,584,310 | | |
| Nickel, tons | 22,850 | 4,736,460 | | |
| Platinum, ounces | ‡2,366 | 80,736 | 2,881 | 2,404,889 |
| Palladium, ounces | ¶4,316 | 147,235 | | |
| Iron ore, tons | 117,357 | 238,884 | 687 | 550,744 |
| Pig iron, tons | 589,593 | 8,054,369 | 846 | 636,420 |
| Lead (concentrates), tons | 26 | 1,290 | 19 | 3,074 |
| | .......... | $34,945,069 | 9,362 | $8,392,907 |
| Less Ontario iron ore smelted into pig iron (71,589 tons) | .......... | 145,326 | ...... | .......... |
| Net metallic production | .......... | $34,799,743 | ...... | .......... |
| **Non-metallic—** | | | | |
| Arsenic, tons | 4,166 | 79,297 | § | § |
| Brick, common, No. | 385,000,000 | 3,178,250 | 2,582 | 1,012,469 |
| Tile, drain, No. | 16,463,000 | 279,579 | | |
| Brick, paving, etc., No. | 8,082,000 | 221,986 | 732 | 386,627 |
| Brick, pressed, No. | 65,598,000 | 634,169 | | |
| Building and crushed stone | .......... | 953,839 | 829 | 371,041 |
| Calcium carbide, tons | 1,998 | 120,000 | 44 | 27,697 |
| Cement, Portland, bbl. | 2,993,367 | 3,365,659 | 1,551 | 876,722 |
| Corundum, tons | 1,960 | 233,212 | 197 | 123,465 |
| Feldspar, tons | 13,633 | 28,916 | 60 | 21,257 |
| Graphite, tons | 1,246 | 65,076 | 84 | 24,201 |
| Gypsum, tons | 31,331 | 50,246 | 140 | 49,823 |
| Iron pyrites, tons | 20,744 | 71,043 | 170 | 115,342 |
| Lime, bushels | 2,297,525 | 281,672 | 379 | 113,344 |
| Mica, tons | 570 | 57,384 | 79 | 35,116 |
| Natural gas, million cubic feet | 12,414 | 2,268,022 | 277 | 184,351 |
| Peat, tons | 175 | 725 | 15 | 520 |
| Petroleum, Imperial gallons | 8,432,730 | 344,537 | ‖699 | ‖436,852 |
| Pottery | .......... | 52,445 | 34 | 17,630 |
| Quartz, tons | 94,758 | 179,576 | 112 | 68,506 |
| Salt, tons | 90,986 | 450,251 | 219 | 151,218 |
| Sewer pipe | .......... | 464,627 | 230 | 140,398 |
| Talc, tons | 6,726 | 61,358 | 79 | 32,396 |
| Non-metallic production | .......... | 13,541,869 | 8,512 | 4,198,975 |
| Add metallic production | .......... | 34,799,743 | 9,362 | 8,392,907 |
| Total production | .......... | 48,341,612 | 17,874 | 12,591,882 |

*See under "Gold." †See under "Silver. ‡See under "Platinum." ¶See under "Palladium." §Included under "Silver" and "Cobalt." §In refining works only.

*Extracts from Report of Bureau of Mines, 1913.

the Seine River, where they found gold indeed, but failed to open up a permanent gold field. The rumours of placer gold drew a crowd of prospectors into the wilds of Michipicoten in 1897. They found no golden sands, but in 1898 there was discovered the Helen mine, which brought about the building of the Algoma Central Railway. A stretch of fertile land at the head of Lake Timiskaming had called for years for connection with older Ontario, but not even the standing promise of a substantial bonus by the Government induced private capital to undertake the construction of a railway. The Government itself set about the task, and Cobalt was discovered, one of the richest silver camps ever made known. Gowganda, South Lorrain and Casey followed, and in 1909 Porcupine, now getting into its stride as a producer of gold.

The only key to the future is found in the past, and in the vast area of pre-Cambrian rocks yet unprospected in Northern Ontario—to which was added last year the principality of Patricia—it can hardly be doubted that many more deposits of mineral wealth will be found, some of them perhaps as rich as any that have yet been brought to light.

For the year 1912 the returns made by mining companies and mine owners show the aggregate production of minerals and mineral products to have had a value at the point and in the form produced of \$48,341,612. In 1911 the value was \$41,976,797, so that the increase for the year was \$6,364,815, or 14.9 per cent.

The increase in production as compared with 1911 was largely in the metals, the value of which was greater by \$5,696,876, or 19.5 per cent. Non-metallic substances advanced in value by \$667,939, or 5.1 per cent. Of the entire output, the metalliferous list provided 72 per cent., and the non-metalliferous 28 per cent., as against 70 per cent. and 30 per cent. respectively in 1911.

Among the metals decided gains were made in gold (\$2,071,449), silver (\$1,718,023, or 10 per cent.), nickel \$1,071,986, or 29.2 per cent.), copper (\$303,192, or 23.6 per cent.), and cobalt (\$144,891, or 84.7 per cent.). The gold production given for 1912 includes a considerable output really belonging to the six years beginning with 1907, of which no report has been made until now. The item for cobalt also obtains some advantage from the fact that much of the mixed oxides of cobalt and nickel which are produced in the process of refining the ores from Cobalt are shipped without being separated from each other. Cobalt predominating, both in quantity and value, the whole is credited to cobalt alone. There was a moderate advance in pig iron (\$338,055, or 4.3 per cent). The single decrease was in iron ore (\$207,046, or 46.1 per cent.).

In the non-metallic substances, the chief increases were in common brick (\$376,279, or 13.5 per cent.), paving and fancy brick (\$135,301, or 156 per cent.), pressed brick (\$69,539, or 12.1 per cent.), stone (\$61,212, or 6.8 per cent.), corundum (\$86,054, or 5.8 per cent), quartz, \$115,171, or 17.8 per cent.), and sewer pipe (\$54,563, or 13.3 per cent.). The largest decreases were in Portland cement (\$274,983, or 7.5 per cent.), faldspar (\$22,694, or 43.9 per cent.), iron pyrites (\$47,414, or 40 per cent.), and drain tile (\$69,966, or 20 per cent.).

**An Accelerating Production.**—During the five years beginning with 1908, the products of the mines, quarries and mineral works of the Province have increased in value by 88 per cent. It is in the metalliferous materials that the more notable increases have taken place. The entire list of products of this kind participates in the increase save one—iron ore, the output of which has of late shown a tendency to diminish. Gold remained stationary at a small production until 1912, when the effect of the opening up of the Porcupine deposits began to be seen. Silver, notwithstanding a reduction in the quantity produced, brought a greater return in 1912 than in any previous year, because of the higher prices which prevailed. Nickel expands steadily, and carries along with it its by-product, copper. Cobalt is also a by-product, the figures for which are assuming more importance as the business of refining and especially of marketing it is being mastered. Among the rarer metals platinum and palladium reappear in 1912, after an absence of some years.

The changes in the production of the non-metallic materials have not been so marked. There has been a steady growth in the output and value of brick of all varieties, also of stone both for building purposes and crushed for road material and use as a flux. Portland cement shows a rapid growth until 1912, when for the first time since the manufacture began in 1891, there was a check in the output, the figures falling below those for 1911. Lime alone among the materials of construction seems to be losing ground, possibly because of partial displacement by cement. The decline in the yield of petroleum, remarked on in this report annually for a number of years, shows no symptom of abatement. Natural gas continues to advance, but the increase in 1912 over 1911 is comparatively small. Salt maintains an annual production of less than half a million dollars in value, and shows little fluctuation from one year to another. Sewer pipe made in Ontario appears to be coming into better demand, for the production has been for some years rising in value; but another clay product, drain tile, shows an unusual falling off in 1912. Pottery, too, remains stationary. Notwithstanding private and governmental effort, the manufacture of peat makes little headway, measured at any rate by quantity of actual output. The milling of talc is becoming more important yearly; mica barely holds its own against competition from India; the feldspar quarries on the Kingston and Pembroke Railway were active during the later part of the five-year period, but less so in 1912, and iron pyrites also failed to maintain in that year the advances successively made for several years before. Graphite and gypsum have both increased, the latter markedly so; this is true also of corundum, though the destruction by fire of the only operating plant for treating this mineral may cause a temporary stoppage of production. Quartz for flux and converter linings is being raised in large quantities; white arsenic, made from the ores of Cobalt, has of late found a good market; carbide of calcium, though higher in 1912 than in 1911, did not attain to the level of the earlier part of the five-year term. The production of apatite, or phosphate of lime, has practically ceased, and fluorspar, though appearing in the tables for 1910 and 1911, has not yet been produced in quantity.

**Total Production of Metals in Ontario.**

| Product. | Value. |
|---|---|
| Gold | \$4,734,713 |
| Silver | 97,176,289 |
| Platinum and Palladium | 290,755 |
| Cobalt | 1,072,141 |
| Nickel | 41,012,763 |
| Copper | 17,239,531 |
| Iron ore | 6,724,385 |
| Pig iron | 57,246,101 |
| Lead | 117,290 |
| Zinc ore | 92,410 |

The footing of the valuation column in the above table is $225,706,378. The only item in which there is any duplication or overlapping is iron ore, a considerable proportion of which was smelted into pig iron, and so included in the latter. Making ample deduction for this, it would appear that up to the end of 1912, the selling value at the mine or works of the metals and metalliferous substances produced in this Province was $220,000,000 at least. If the nickel and copper were valued at the prices of the refined metals in New York, according to the method employed by the Mines Department at Ottawa, the total would be about $290,000,000.

**Gold.**—For the first time in the history of Ontario, there was in 1912 a substantial production of gold. The largest previous yield was in 1899, when a number of stamp mills were operating in the Lake of the Woods and Seine River districts. The output that year amounted to $423,978, but the performance of these fields not proving equal to their promise, the production fell off in 1900 to $297,861. Last year the actual yield of gold within the limits of the Province was 86,603 ounces, worth $1,790,087, or over four times as much as in 1899. To this is added 15,675 ounces, valued at $323,999, recovered at the Orford works of the International Nickel Company, New Jersey, in refining the nickel-copper mattes from the Canadian Copper Company's mines in the Sudbury district. This extraction extended over the six years from 1907 to 1912, but no part of it has hitherto been included in the Bureau's statistics, since no returns of it were made. Though the effect is to swell the figures for the twelve months beyond their strict limits, it seems proper to incorporate this production in the official record at the first opportunity. The total number of ounces stands therefore at 102,278, with a value of $2,114,086.

The feature of the year was the coming into production of the Porcupine camp. The Dome and Hollinger mines both suffered the destruction of their milling plants, then well on their way to completion, by the unprecedented fires of 1911, which were also accompanied by so lamentable a loss of human life. It was not until April and June, respectively, 1912, that the new mills at the Dome and Hollinger were ready to begin work, so that the output for last year by no means represents a full twelve months' operations.

**At the Hollinger mine**, the plant went into commission July 1st, with the full complement of thirty stamps, and during the remainder of the year it treated 45,195 tons of ore and rock, from which a recovery was made of $933,682, or an average of $20.33 per ton. Of this, $972,135 was in gold, and $6,547 in silver. The mill and process have proven satisfactory, but after a short time experience led to the abandonment of amalgamation in favour of cyanidation of the concentrates. This necessitated no change in the apparatus, the substitution of cyanide of potassium for mercury in the grinding pans being all that was required. At the end of the year, the underground workings amounted to 8,918 feet, distributed as follows: 5,039 feet of drifts, 2,764 feet of crosscuts, 451 of winzes, 232 of raises, and 432 of shafts. There are levels at 100, 200 and 300 feet. The reserves of ore are placed at $10,230,000, of which $7,560,000 is credited to No. 1 vein, and $1,200,000 to No. 2. In computing the reserves, no allowance is made for ore which may exist beyond a depth of 50 feet below the deepest working of any vein. The total operating profits up to 31 December, 1912, were $600,664, and a monthly distribution of dividends at the rate of 3 per cent. per month was begun in November. Three such dividends of $90,000 each were declared before the close of the year.

Operations here and at the Dome and other mines of the Porcupine camp were much interfered with by a strike of the miners, which began early in November, the men refusing to accept a reduction of wages. The strike was unsuccessful, for the companies were able to procure labour enough to operate the mines and mills, though for a time only partially so, and not a little of the help obtained was of an indifferent character.

**The Dome mine** also operates thirty stamps, and crushed a large tonnage of ore from the date at which work began. The workings of the Dome Company are open cut, and both the quartz and the schist in which it occurs are put through the mill.

**Other mines** which turned out bullion at Porcupine in 1912 were the Vipond and McIntyre. In Eastern Ontario, the Cordova; in Lake of the Woods, the Olympia; and in Sturgeon Lake, the Northern Gold Reef, Limited (St. Anthony) contributed to the output. Of the total production of $2,014,126, Porcupine supplied $1,730,628, and the remainder of the Province, $452,656, including the gold obtained in refining the Canadian Copper Company's mattes during the last six years, as above set forth.

Other mines at Porcupine, such as Jupiter, McEnaney, Pearl Lake, etc., may be expected to become producers ere long, and it is now evident that this camp is destined to make a substantial contribution to the gold output of Canada, and to break the long record of disappointment which so far has been the chief result of gold discoveries in Ontario.

There are other districts where development has been going on with more or less activity for some time, including Larder Lake, Swastika, Munro Township, Long Lake, etc., but none of them have yet reached the stage of permanent production.

**Kirkland Lake.**—A find of more than ordinary interest has been made at Kirkland Lake, in the Township of Teck. On the Tough-Oakes claims, some very rich ore occurs in small stringers. Since the beginning of 1913, several carloads of ore have been taken out by open-cut methods and shipped in bags, the ore realizing $448 per ton. The property is being opened up by Mr. C. A. Foster, of Haileybury, discoverer and first owner of the Foster silver mine at Cobalt.

**A New Find in Michipicoten.**—Towards the close of last season, a discovery of gold was made in township 34, Range 24, Michipicoten. During the fall and winter a number of mining claims were staked out, but no work has yet been done to test their value. The locality of the discovery is about 55 miles southward of White River station on the Canadian Pacific Railway, and about 10 miles north of Lake Superior. A good canoe route, with only two difficult portages, leads up White River, across Pokay Lake, down the Dog River, and over a number of small lakes into Lake Michi Biju. The more promising of the two main outcrops is a 3-foot silicified zone cutting a well-mineralized green schist, and ramified by numerous small stringers of quartz. At the discovery post the hanging wall of the zone is exposed to a height of 12 feet above the adjoining small valley. On the wall, the gold occurs in small blebs and scales and again is heavily intermixed with arsenical pyrites, which occurs in patches. A sample of the pyrites was assayed by the Provincial Assayer and showed a high gold content. This sample was taken from the wall only, and covered but 15 feet of the best material then showing, consequently the result cannot be considered as that of a fair average sample. It is as yet uncertain whether or not the gold-bearing arsenical pyrites is confined to the hanging wall or, what seems more likely, whether it is associated with the numerous small enclosed quartz stringers that follow the trend of the zone.

The other gold-bearing formation occurs a mile farther north. Here, on the edge of a small lake, a quartz vein having a width of at least 20 feet at the discovery post, outcrops prominently for a distance of 200 feet. The only sample taken, from the hanging wall, showed a gold content of $1.20. The quartz looks promising, and it is possible that systematic sampling may prove the vein to be worthy of exploitation.

Owing to the closeness of the freeze-up, nothing in the way of sampling or actual testing of either of the two main outcrops could be undertaken. It is intended to prospect the formations during the coming season. The geological conditions are in general favourable, and resemble those obtaining in other Ontario goldfields. The thick forest growth and the heavy overburden, however, combine to make prospecting in this but little explored part of the Province difficult, tedious and expensive.

**Gold Mining Companies.**—Following is a list of the gold mining companies in operation during 1912, distinguishing between those which produced bullion and those which did not:

**Silver.**—The production of silver last year amounted to 30,719,883 ounces, which was 787,997 ounces less than in 1911. Owing to the higher price of silver, however, the value was greater by $1,718,023, or $17,671,918 in all. Cobalt, of course, was the preponderant source of supply, others being the gold obtained from Porcupine and elsewhere, and the nickel-copper mattes of Sudbury. These sources contributed respectively as follows:

| | Ounces. | |
|---|---|---|
| Cobalt proper | 28,859,764 | |
| Gowganda | 549,976 | |
| South Lorrain | 834,119 | |
| | | 30,243,859 |
| Gold ores | | 16,776 |
| Canadian Copper Company's mattes | | 459,248 |
| Total | | 30,719,883 |

The explanation of the last item is similar to that already given regarding the gold obtained from the same material; the quantity mentioned was recovered at the Orford works of the International Nickel Company in New Jersey during the last six years. It has not been included in any of the statistics previously published by the Bureau of Mines for the reason that it was omitted in the returns for the years in question.

From the year 1904 when the first silver was obtained from the mines of Cobalt, the production of the camp has amounted in all to 15,815,839 ounces, the sum received by the mining companies for which was $81,731,115.

**Ontario Gold Mining Companies.**

| Name of Company. | Name of Mine. | Locality. | P. O. Address of Manager, etc. |
|---|---|---|---|
| Producing Companies— | | | |
| The Dome Mines Company Limited | Dome | Porcupine | South Porcupine. |
| Hollinger Gold Mines, Limited | Hollinger | Porcupine | Timmins. |
| Vipond Porcupine Mines, Company, Limited | Vipond | Porcupine | Schumacher. |
| McIntyre Porcupine Mines, Limited | McIntyre | Porcupine | Schumacher. |
| Northern Gold Reef, Limited | St. Anthony | Sturgeon Lake | Toronto. |
| Cordova Mines, Limited | Cordova | Peterboro county | Cordova Mines. |
| Olympia Gold Mining Company, Limited | Olympia | Shoal Lake | 9 Reaney Street, St. Paul, Minn. |
| Non-producing Companies— | | | |
| Ore Chimney Mining Company, Limited | Ore Chimney | Frontenac county | 335 Brisbane Bldg., Buffalo, N.Y. |
| Crown Reserve Mining Company, Limited | McEnaney | Porcupine | Cobalt. |
| Canadian Exploration Company, Limited | Long Lake | Long Lake | Naughton. |
| Lucky Cross Mines of Swastika, Limited | Lucky Cross | Swastika | Swastika. |
| The Swastika Mining Company, Limited | Swastika | Swastika | 18 Toronto Street, Toronto. |
| The Gilmour Mining Company, Limited | Gilmour | Hastings county | Gilmour. |
| Jupiter Mines, Limited | Jupiter | Porcupine | Schumacher. |
| Dome Lake Mining & Milling Company, Ltd. | Dome Lake | Porcupine | Schumacher. |
| Pearl Lake Gold Mines, Limited | Pearl Lake | Porcupine | Schumacher. |
| Plenaurum Mines, Limited | Planaurum | Porcupine | Schumacher. |
| Goldfields, Limited | Goldfields | Larder Lake | Larder Lake. |

Among the non-producing companies, stamp mills were in course of erection about the beginning of 1913 by Crown Reserve, Lucky Cross, Swastika, Dome Lake. Canadian Exploration Company and Goldfields, Limited, are already equipped, having made extensive alterations during the year, including the installation of hydraulically generated electric power. The former derives current from the Wahnapitae River, and the latter from the falls at Raven Lake.

The producing mines numbered 30 as against 34 in 1911, those whose output was a million ounces or more being—

| | Ounces shipped in 1912. |
|---|---|
| Nipissing | 4,719,578 |
| Coniagas | 3,703,942 |
| La Rose | 2,920,344 |
| Crown Reserve | 2,714,766 |
| McKinley-Darragh-Savage | 2,704,868 |
| Kerr Lake | 1,895,309 |
| Buffalo | 1,890,150 |
| Cobalt Townsite | 1,505,396 |
| Timiskaming | 1,242,243 |
| Cobalt Lake | 1,123,146 |
| O'Brien | 1,091,631 |

**The other producing mines were** Penn-Canadian, Hargrave, Bailey, Hudson Bay, Casey-Cobalt, Colonial, General, City of Cobalt, Trethewey, Right of Way, Chambers-Ferland, Beaver, Cobalt Provincial, Drummond, Seneca-Superior, Miller Lake-O'Brien, Mann, Wettlaufer-Lorrain. New-comers on the producing list are Bailey, Seneca-Superior and Mann. The following yielded more or less silver in 1911, but none in 1912: Silver Cliff, Standard Cobalt, Green-Meehan, Belellen, Nancy-Helen, Wyandoh, King Edward. The name of the Cobalt Central mine is now Penn-Canadian, and Seneca-Superior partially takes the place of Peterson Lake, being situated on part of the bed of that lake, or rather of Cart Lake which at the time of making the grant was thought to be an extension of the former, instead of a separate body of water.

The producing mines in Gowganda were Miller Lake-O'Brien, Millerett and Mann, and in South Lorrain, Wettlaufer-Lorrain.

**Shipments.**—Shipments of ore and concentrates from Cobalt can no longer be taken as indicating the tonnage raised from the mines, since the tendency towards absolute refinement of the silver on the spot is becoming more marked year by year. For instance, two of the leading mines, Nipissing and Buffalo, are now equipped for reducing their entire output, both of high grade and low grade ore, to merchantable bars, which leave the camp in an express car. In consequence, the quantity of bullion produced at Cobalt is steadily increasing, being 5,080,127 ounces last year, as compared with 3,122,976 ounces in 1911. The shipments by freight were smaller than in the previous year, the ore shipped out amounting to 10,719 tons, as against 17,278 tons in 1911, and concentrates to 11,214 tons, as against 9,393. The several classes of material sent out of the camp and their silver contents, respectively, were as follows:

| Product. | Quantity. (tons) | Silver. (ounces) |
|---|---|---|
| Ore | 10,719 | 15,395,504 |
| Concentrates | 11,214 | 9,768,228 |
| Bullion | 11,214 | 5,080,127 |
| Total | 21,933 | 30,243,859 |

**Ore Concentration.**—In all, 456,167 tons of ore were put through the concentrating plants, of which 101,338 tons were treated at the several custom concentrators now working in the camp, namely, those of the Nipissing Reduction Company, the Dominion Reduction Company, and the Northern Concentrators, Limited. The remainder, 354,829 tons, were manipulated by the mining companies in their own plants. The average ratio of concentration works out therefore at 39 tons of ore to one ton of concentrates. The silver contents of the concentrates were 9,768,228 ounces, an average of 871 ounces per ton. The quantity of ore or rock subjected to concentration being 456,167 tons, the recovery was at the rate of 21.4 ounces per ton. Assuming that 85 per cent. of the original silver was contained in the concentrates, the silver contents of the concentrating material as it went into the mill would be 25.1 ounces per ton. These results correspond closely with those obtained in 1911, when the concentrates carried 858 ounces per ton, the silver recovered averaging 21.6 ounces per ton, and the concentrating ore 25.4 ounces per ton.

Four refineries were in operation in Ontario on ore and concentrates from Cobalt last year, namely, those of the Canadian Copper Company, at Copper Cliff, the Coniagas Reduction Company, at Thorold, the Deloro Mining and Reduction Company, at Deloro, and the Canadian Refining and Smelting Company at Orillia. Of these, the one at Copper Cliff worked for part of the year only, and is still idle, while the Orillia works have since been burned down. The total quantity of ore and concentrates treated at these establishments was 8,111 tons, which yielded 15,675,218 ounces of silver. Bullion produced at Cobalt itself amounted to 5,080,127 ounces, so that not less than 67.5 per cent. of the total silver yield of the mines was refined in the Province, as compared with 66 per cent. in 1911.

The Dominion Refineries, Limited, have established a plant at North Bay, for the treatment of Cobalt ores low in silver. A new refinery is being built at Kingston, by the Buffalo and Ontario Smelting and Refining Company, Limited. The Metals Chemical Company, Limited, have also erected a plant for the production of cobalt and nickel oxides at Welland.

A summary of the operations of the silver refineries of Ontario for 1911 and 1912, so far as silver is concerned, is as follows, the by-products being dealt with under their respective headings:

**Operations of Ontario Silver Refineries.**

| | 1911. | 1912. |
|---|---|---|
| Silver refineries in operation | 4 | 4 |
| Silver-cobalt ore received, tons | 9,142 | 8,274 |
| Silver-cobalt ore treated, tons | 9,330 | 8,096 |
| Silver recovered, fine ounces | 17,756,651 | 15,675,218 |
| Value of ditto | $9,248,829 | $9,094,156 |

**Markets and Prices.**—There was a good demand for the silver-cobalt ores during the year. The refining companies in Ontario have, through their efforts to keep their plants supplied, no doubt assisted in maintaining the prices of ore, but in view of the diminution in their number, and the fact that one of them, the Coniagas Reduction Company, is now sufficiently occupied with ore from the Coniagas mine, their influence in this direction is likely for the time being to be less than in the past. New Jersey, Pennsylvania and Colorado smelting works took most of the ore that went to the United States, much of it is low grade, but being silicious, it is found highly useful for mixing with basic material.

Prices of silver are fixed by influences which find their stage largely in the Orient. The requirements for coinage and the arts in the commercial and manufacturing nations of America and Europe absorb considerable quantities, but production continues at a rate which would inevitably depress the price of silver to lower levels were it not for the capacity which India and China have, almost from time immemorial, shown to buy a large share of the world's output. Thus in

1912 the production of silver is estimated to have been 229,569,903 fine ounces, worth at the average price for the year in New York, say, $139,658,850. The imports of India during the year amounted in value to $59,975,802, and of China, to $20,971,423, or together to $80,947,225, a good deal more than one-half the entire output for the year. The explanation of the movement of silver to these countries is two-fold—the medium of exchange is silver, and in India the habit of generations has been, and still is, to use silver in the form of bars, personal ornaments, objects of art, etc., as a means of hoarding the savings of the people. The preliminary market is London, whose control of trade with the East remains unshaken, and to which all the silver mines of the world send their bars of silver, whose size, dimensions and weight are determined by the preferences of the silversmiths of the Indian bazaars. The intercourse between the Pacific coast of the United States and China has led, of late years, to the export of a certain amount of silver to that country from San Francisco. This export last year was in value $11,503,620, as against $9,234,000 in 1911.

The actual price throughout the year was much higher than 1911, the average for fine silver in New York being 60.835 cents per ounce, as against 53.304 cents in 1911. The market steadily advanced from the beginning of the year, and recessions were few and slight. The year closed with silver at 63.365 cents as the average for December. The settlement of the new Republican Government in control of China, and the anticipated reforms in the currency system of that country with their accompaniment of large loans and heavy purchases of silver, the requirements of the Indian Government for coinage purposes which were met by the purchase of £6,000,000 worth of silver in London, and favourable monsoon rains in India, all tended to raise prices, which even the outbreak of the Balkan war in October did not materially check.

The increase in the price of silver over 1911, say 7.531 cents per ounce, applied to the production for the year, meant $2,313,514 additional return to the mining companies of Cobalt.

It may be remarked in connection with the causes which affect the prices of silver that the preference for silver for hoarding purposes which has for so long a time characterized the people of India, seems now to be yielding to a liking for gold. Gold bars, to the value of $39,482,640, were imported into India during 1912, as against $37,699,020 in 1911. How much of this went into the banks for coinage reserve purposes, and how much into the pockets of the people, there are no certain means of determining, but it seems probable that a larger proportion of the savings of the peasants of India are now being invested in gold than formerly, and that the incidence of this tendency will have some effect upon silver prices in the future.

**The other constituents of the Cobalt silver ores** made use of industrially are cobalt, nickel and arsenic. For some time past these elements have not been of interest to the mine owners, since they add nothing to the value of their ore, and for this reason it is impossible to procure exact figures showing the quantities produced. The ores are not assayed for nickel or cobalt or arsenic and it is undoubtedly the case that only a percentage of these substances ever reaches the market in the finished form or in a condition to be made use of industrially. All three constituents are recovered by the Canadian refiners, who treat the ores from Cobalt without admixture of other kinds of ore, and who produce white arsenic, cobalt oxide, nickel oxide, and also a mixture of the oxides of cobalt and nickel which they ship without final separation principally to English and European manufacturers of cobalt oxide. In the case of refineries situated in the United States, the ores from Cobalt are mixed in the smelting charge with ores of lead and copper, etc.; and little or no attempt is made to save the arsenic, nickel or cobalt.

**Health and Labour.**—So far as epidemic diseases are concerned, health conditions were satisfactory during the year at Cobalt. There was an almost complete absence of typhoid, which indeed has not been prevalent in the district since 1909.

As regards labour, the relations between employers and employed have on the whole been tolerably good. The Cobalt miners took no action when their fellow-workmen at Porcupine went out in November, but the question of an eight-hour working day has been the subject of considerable discussion. In several of the leading mines nine hours from bank to bank had for some time constituted a day's labour, and in February, 1913, the mining companies voluntarily made this general.

It will be remembered that a measure to restrict the working hours to eight in every twenty-four for underground employees was introduced into the Legislature by the Government in the session of 1912, but was subsequently withdrawn in order to admit of a fuller investigation of all the conditions not only at Cobalt, but in the other mining districts of the Province. Mr. S. Price, late Mining Commissioner, was appointed to make the investigation, and he reported in favour of an eight-hour day from face to face. An Act was passed in the session of 1913 limiting the hours of underground labour accordingly, and fixing the first day of January, 1914, as the time for the change to take effect.

**The wage scale at one of the leading mines at Cobalt** is as follows per day of nine hours:

Surface.—Surface boss $3.75, carpenters $3.25, carpenters' helpers $2.25, mechanics $3.25, pipe-fitters $3.00, head blacksmith $3.75, blacksmiths $3.25, blacksmiths' helpers $2.75, engineers $3.60, firemen $3.00, head ore-sorter $2.75, ore-sorters or cobbers $2.50, hand-miners $2.75, teamsters $2.50, hoistmen $2.75, cage or bucket-tenders $2.50, other surface labour $2.25.

Underground.—Timbermen $3.25, machinemen $3.25, machinemen helpers $2.75, cage or bucket-tenders $2.50, other underground labour $2.50.

The foregoing scale is about 25 cents per day less than the rates paid at Porcupine at the present time. Much of the labour is non-English-speaking and inexperienced. Skilled miners are in good demand.

**Profits and Dividends.**—The high price of silver made the year 1912 a good one for shareholders in the producing companies, and the sum distributed in dividends was large, being $9,324,049.24, or $590,091.08 more than in 1911. The total amount paid out as dividends and bonuses since the inception of the camp up to the end of 1912 was $39,834,740.54, not including the profits made by private owners, which would increase it by nearly five million dollars more.

The following table gives a statement of the dividends paid by the silver-mining companies of Cobalt, and also other particulars, such as the date of incorporation, amount of capital, etc.

**Dividends and Bonuses Paid and Declared by Silver-C obalt Mining Companies to December 31st, 1912.**

| Name of Company. | Date of Incorporation. | Authorized Capital. | Capital Stock issued | Par value per share. | Declared to end of 1911. | Declared during 1912 | Total Declared Dec. 31, 191 |
|---|---|---|---|---|---|---|---|
| eaver Consolidated Mines, Ltd. | Mar. 5, 1907... | $2,000,000 | $2,000,000 | $1.00 | $170,000 00 | $180,000 00 | $350,000 |
| uffalo Mines, Ltd. | Apr. 27, 1906... | 1,000,000 | 1,000,000 | 1.00 | 1,377,000 00 | 500,000 00 | 1,877,000 |
| ity of Cobalt Mining Company, Limited | Oct. 5 1906.... Jan. 7, 1909.... | 500,000 1,500,000 | 1,500,000 | 1.00 | 139,312 42 | .......... | 139,312 |
| obalt Central Mines Company | Dec. 13, 1906.. | 5,000,000 | 5,000,000 | 1.00 | .......... | 75,000 00 | 75,000 |
| obalt Lake Mining Company, Ltd. | Dec. 22, 1906.. | *4,070,834 | 3,929,166 | 1.00 | 192,845 00 | .......... | 192,845 |
| obalt Silver Queen, Ltd. | Apr. 1, 1906.... | 1,500,000 | 1,500,000 | 1.00 | 315,000 00 | .......... | 315,000 |
| obalt Townsite Mining Co., Ltd. | May 6, 1906... | 100,000 | 45,011 | 1.00 | 125,000 00 | 346,000 00 | 471,000 |
| oniagas Mines, Ltd. | Nov. 24, 1906.. | 4,000,000 | 4,000,000 | 5.00 | 2,840,000 00 | 1,440,000 00 | 4,280,000 |
| rown Reserve Mining Co., Ltd. | Jan. 16, 1907... | 2,000,000 | 1,999,957 | 1.00 | 3,714,509 40 | 1,061,288 40 | 4,775,797 |
| oster Cobalt Mining Co., Ltd. | Feb. 14, 1906.. | 1,000,000 | 915,588 | 1.00 | 45,000 00 | .......... | 45,000 |
| err Lake Mining Company, Ltd. | Aug. 9, 1905... | †40,000 | 40,000 | 100.00 | 3,940,000 00 | 670,000 00 | 4,610,000 |
| a Rose Mines, Ltd. | Feb. 21, 1907... | ‡6,000,000 | 6,000,000 | 5.00 | 2,672,000 00 | 1,000,546 84 | 3,672,546 |
| cKinley-Darragh-Savage Mines of Cobalt, Ltd. | Apr. 9, 1906... | 2,500,000 | 2,247,692 | 1.00 | 2,156,791 38 | 1,123,846 00 | 3,280,637 |
| ipissing Mining Company, Ltd. | Dec. 16, 1904.. | §250,000 | 250,000 | 100.00 | 8,325,797 25 | 1,842,500 00 | 10,168,297 |
| ight of Way Mining Company, Ltd. | July 13, 1906.. | 500,000 | 500,000 | 1.00 | 324,643 93 | .......... | 324,643 |
| he Right of Way Mines, Ltd. | Sept. 11, 1909.. | 2,000,000 | 1,685,500 | 1.00 | 202,260 00 | .......... | 202,260 |
| imiskaming and Hudson Bay Mining Co., Ltd. | July 29, 1903.. | 25,000 | 7,761 | 1.00 | 1,521,156 00 | 209,547 00 | 1,730,703 |
| he Hudson Bay Mines, Ltd. | July 16, 1909.. | 3,500,000 | 3,200,050 | 5.00 | 394,903 42 | 192,003 00 | 586,906 |
| imiskaming Mining Company, Ltd. | Nov, 16, 1906.. Jan. 1, 1908.... | 2,500,000 | 2,500,000 | 1.00 | 1,009,156 00 | 300,000 00 | 1,309,156 |
| rethewey Silver Cobalt Mine, Ltd. | May 30, 1906.. June 1, 1911.. | 1,000,000 2,000,000 | 1,000,000 | 1.00 | 761,998 50 | 100,000 00 | 861,998 |
| Vettlaufer-Lorrain Silver Mines, Ltd. | Nov. 30, 1908.. | 1,500,000 | 1,416,590 | 1.00 | 283,318 00 | 283,318 00 | 566,636 |
| Total | | | | | $30,510,691 30 | $9,324,049 24 | $39,834,740 |

* Reduced by shares purchased for cancellation from $5,000,000.
† Kerr Lake Mining Company, incorporated under the laws of the State of New York, capital $3,000,000.
‡ La Rose Consolidated Mines Company, incorporated under the laws of the State of Maine, capital $7,500,000.
§ Nipissing Mines Company, incorporated under the laws of the State of Maine, capital $6,000,000.

Below is given a list of the mines producing silver in 1912, with the post office address of the manager or other officer in charge of the property. The order of arrangement is alphabetical:

**Ontario Silver Producing Mines.**

| Name of Company or Owner. | Name of Mine. | Locality. | P. O. Address of Manager, etc. |
|---|---|---|---|
| Bailey Cobalt Mines, Limited | Bailey | Cobalt | Giroux Lake. |
| Beaver Consolidated Mines, Limited | Beaver | Cobalt | Cobalt. |
| Buffalo Mines, Limited, The | Buffalo | Cobalt | Cobalt. |
| Casey Cobalt Silver Mining Company, Ltd. | Casey-Cobalt | Casey Township | New Liskeard. |
| Chambers-Ferland Mining Company, Ltd. | Chambers-Ferland | Cobalt | Cobalt. |
| City of Cobalt Mining Company, Limited | City of Cobalt | Cobalt | Cobalt. |
| Cobalt Lake Mining Company, Limited | Cobalt Lake | Cobalt | Cobalt. |
| Cobalt Provincial Mining Company, Limited | Provincial | Cobalt | Cobalt. |
| Cobalt Townsite Mining Company, Limited | Townsite | Cobalt | Cobalt. |
| Colonial Mining Company, Limited | Colonial | Cobalt | Cobalt. |
| Coniagas Mines, Limited, The | Coniagas | Cobalt | Cobalt. |
| Crown Reserve Mining Company, Limited | Crown Reserve | Cobalt | Cobalt. |
| Drummond Mines, Limited | Drummond | Cobalt | Cobalt. |
| Hargrave Silver Mines, Limited | Hargrave | Cobalt | Cobalt. |
| Hudson Bay Mines, Limited | Hudson Bay | Cobalt | Cobalt. |
| Kerr Lake Mining Co., Limited | Kerr Lake | Cobalt | Cobalt. |
| La Rose Mines, Limited | La Rose, Lawson, Princess, etc. | Cobalt | Cobalt. |
| McKinley-Darragh-Savage Mines of Cobalt, Limited | McKinley-Darragh & Savage | Cobalt | Cobalt. |
| Millerett Silver Mining Company, Limited | Millerett | Gowganda | Gowganda. |
| Nipissing Mining Company, Limited | Nipissing | Cobalt | Cobalt. |
| O'Brien, M. J. | O'Brien | Cobalt | Cobalt. |
| O'Brien, M. J. | Miller Lake-O'Brien | Gowganda | Gowganda. |
| Penn-Canadian Mines, Limited | Penn-Canadian | Cobalt | Cobalt. |
| Right-of-Way Mines, Limited | Right-of-Way | Cobalt | Cobalt. |
| Ryckman, E. B. | Mann | Gowganda | Gowganda. |
| Seneca-Superior Silver Mines, Limited | Seneca-Superior | Cobalt | Cobalt. |
| Timiskaming Mining Company, Limited | Timiskaming | Cobalt | Cobalt. |
| Trethewey Silver Cobalt Mines, Limited | Trethewey | Cobalt | Cobalt. |
| Wettlaufer Lorrain Silver Mines, Limited | Wattlaufer | South Lorrain | Silver Centre. |

**Cobalt.**—The opening of the silver mines of the Cobalt district has changed the course of the world's trade in cobalt. The chief use of cobalt is as a colouring material in the manufacture of fine chinaware, and the largest users are the great porcelain makers of Germany, France, and England. For this purpose it is employed in the form of cobalt oxide, CoO, the theoretical composition of which is 78,66 per cent. by weight of cobalt, and 21.34 per cent. of oxygen. Commercially, however, the proportion of cobalt is considerably lower. The commoner form is black oxide, which contains from 68 to 71 per cent. of cobalt; some manufacturers prefer the gray oxide, which may contain 73, 74, or even 75 per cent. of cobalt. A small percentage of nickel, or of the other constituents of the original ore, is not considered deleterious.

**Nickel.**—There are now three sources of nickel supply in Ontario:—(1) The mines of the Sudbury district, (2) the Alexo mine in Dundonald township, (3) the ores of the Cobalt silver camp. The last-named is of little commercial moment; the second is significant as indicating the possibility of nickel in quantity being found outside of the recognized area; while the first is the chief source, and one rapidly growing in output and importance.

There were raised from the mines of Sudbury in 1912, 735,656 tons of ore and from the Alexo mine (treated at the Mond Company's works) 1,792 tons, or 737,656 tons in all. The ore was taken from the following deposits:—

| | Tons. | Tons. |
|---|---|---|
| Canadian Copper Company: | | |
| Creighton mine | 518,417 | |
| Crean Hill mine | 33,507 | |
| No. 2 mine | 66,372 | |
| | | 618,296 |
| Mond Nickel Company: | | |
| Victoria No. 1 mine | 34,287 | |
| Garson mine | 83,281 | |
| Alexo mine | 1,792 | |
| | | 119,360 |
| Total | | 737,656 |

There was charged into the smelting furnaces 725,065 tons, the product of which was 41,925 tons of Bessemer matte, containing 22,421 tons of nickel. The value of nickel contents was returned as $4,722,040, or about 10.5 cents per pound. As compared with 1911, the production of matte was greater by 9,318 tons and of nickel by 5,372 tons, being in fact the largest output of any year since the industry was established. The nickel contents of the ore, computed on the basis of the quality of matte produced, were 61.8 pounds per ton of 2,000 lb., or 3.09 per cent., exclusive of the losses in roasting and smelting.

**Progress of Nickel Mining.**—The demand for nickel was active throughout the year, and the two producing companies—the Canadian Copper Company and the Mond Nickel Company—were fully employed. Both indeed have had to increase their facilities for production. The Copper Company has enlarged and improved its plant at Copper Cliff, and the Mond Company has for some time had under construction a new smelter at Coniston, near the point where the Canadian Northern railway crosses the line of the Canadian Pacific, east of Sudbury. When these works are completed, which will probably be in the spring of 1913, the company will abandon their present site at Victoria mines, and move their entire plant to Coniston, which has the advantage of greater proximity to their Garson mines, now the main source of the company's ore supply.

The indications are that a third company will soon be producing nickel. The holdings of the Dominion Nickel Copper Company, of which company Mr. J. R. Booth, of Ottawa, and Mr. M. J. O'Brien, of Renfrew, were leading members, have been bought by interests represented by Messrs. Holmes and Wilson. These holdings included the Whistle and other properties on the northern nickel range and the Murray mine, the first deposit discovered in the Sudbury district, formerly owned and worked by the Vivians, of Swansea, but idle for many years; also the Gertrude and Elsie mines, formerly held by the Lake Superior Corporation. The new concern proposes to erect a smelter at the Murray mine capable of treating 1,500 tons of ore per day, so constructed as to admit of ready enlargement to 5,000 tons capacity. Bessemer matte of the type produced by the companies now operating will be turned out, and there is a possibility that the nickel may be refined in Ontario by the Hybinette process, the rights of which for the American continent are owned by the newcomers.

Results of much significance have been obtained from extensive exploration of the Sudbury nickel fields by diamond drill borings. These have been carried on by all three companies. At the Murray mine, some distance from the old workings, a large body of ore has been found, the existence of which was unknown to the original owners. Owing to this discovery, the site of the proposed works has been changed from Blue lake, near the Whistle mine, to the Murray. At what is known as the No. 3 or Frood mine, the Canadian Copper Company has had a number of drills at work for over two years, and the borings have revealed an extensive ore deposit, stated to be larger than even the Creighton. The company has constructed a railway from Copper Cliff to the Frood mine, and is putting down a four-compartment incline shaft and a three-compartment vertical shaft in order to develop the deposit. The company plans to extract some 10,000 tons per day from this mine. Frood extension, immediately north of the Frood proper, is owned by the Mond Nickel Company. The ore body crosses into the Mond ground, and the latter are sinking a shaft to intercept it at a depth of 800 feet. It is hardly too much to say that these developments have placed the Sudbury nickel field in a position of complete dominancy with regard to the production of this metal.

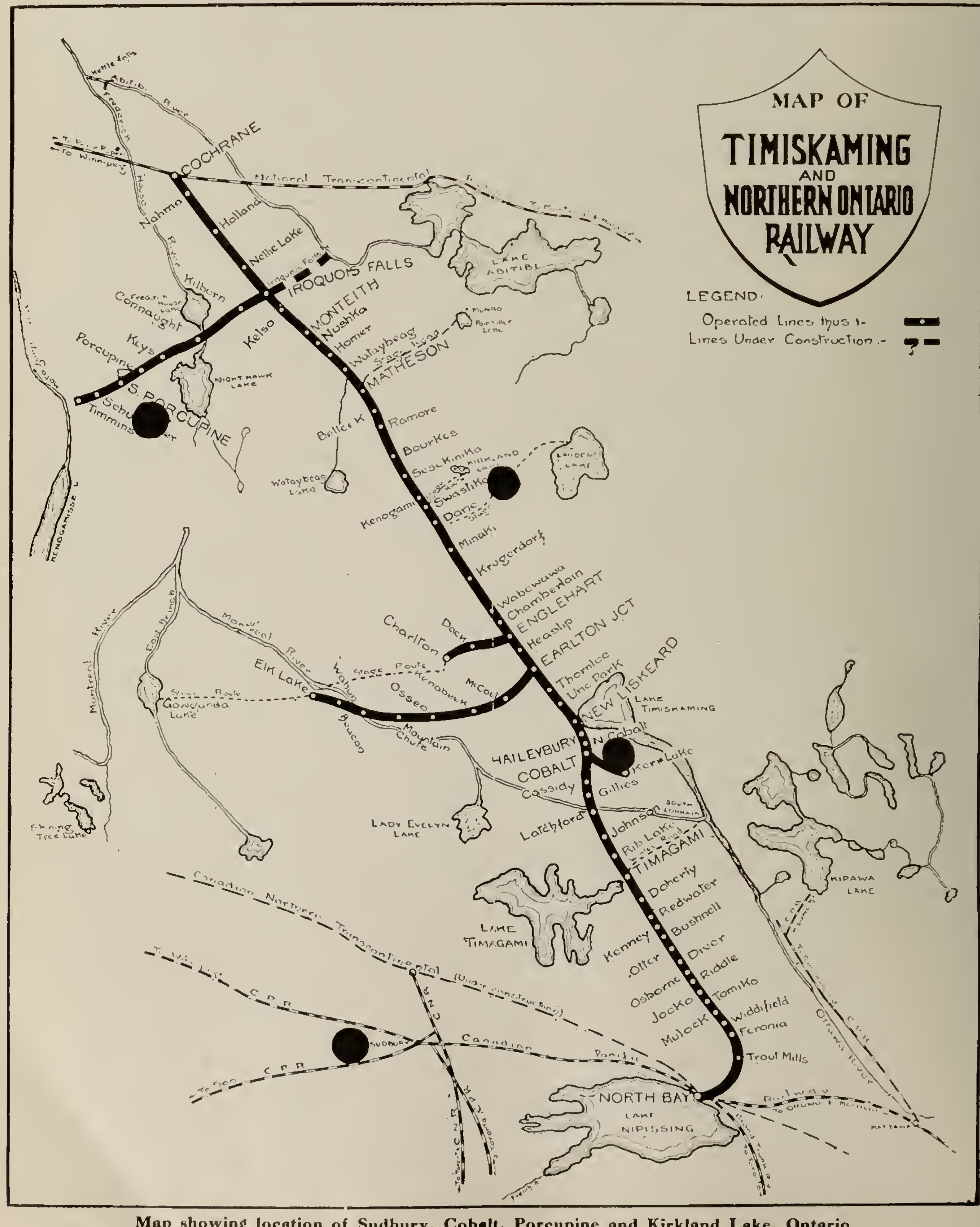
The quantity of nickel recovered from the ore of the Cobalt silver mines can only be estimated, but in any event it is not large. At the proportion of nickel assumed in this Report, namely, 1.47 per cent., nickel contents of the 1912 production would be about 429 tons. Part of this is wasted in the smelting of the ores by the United States refining plants, part of it is separated as nickel oxide in Ontario, and part is exported mixed with cobalt oxide for final treatment by the cobalt oxide makers of Europe, and no doubt is recovered in their works. The quantity of nickel oxide produced and marketed as such last year by the home refiners was 117,160 lb., containing 78,392.20 lb. metallic nickel, the bounty paid on which at the rate of 6 cents per pound of metallic nickel was $4,703.53. The nickel contents of the Cobalt ores would appear to have yielded to mine-owners and Ontario refiners in 1912 some $14,220, and this amount is reckoned in these statistics as the money equivalent of the 429 tons mentioned above.

New uses for nickel are being found from time to time. The Sydney (Australia) correspondent of the Mining Journal (London, Eng.), of 10th May, 1913, states that specimens of a new alloy called "Ormiston metal" have recently been shown in that city. The composition is 90 per cent. aluminum and 10 per cent. nickel. "Ormiston metal" is described as approaching aluminum in lightness. It can, it is said, be turned out as soft as copper or as hard as steel; can be soldered or brazed on another metal; in tensile strength it is equal to mild steel; it does not tarnish; and a piece kept in sea-water for many weeks showed no sign of corrosion.

The course of the nickel industry during the fiveyears beginning with 1908 is shown by the following table:—

**Nickel-Copper Mining in Ontario, 1908 to 1912.**

| Schedule. | 1908 | 1909 | 1910 | 1911 | 1912 |
|---|---|---|---|---|---|
| Ore raised, tons | 409,551 | 451,892 | 652,392 | 612,511 | 737,656 |
| Ore smelted, tons | 360,180 | 462,336 | 628,947 | 610,788 | 725.065 |
| Bessemer matte produced, tons | 21,197 | 25,845 | 35,033 | 32,607 | 41,925 |
| Nickel contents, tons | 9,563 | 13,141 | 18,636 | 17,049 | 22,421 |
| Copper contents, tons | 7,501 | 7,873 | 9,630 | 8,966 | 11,116 |
| Value of Nickel | $1,866,059 | $2,790,798 | $4,005,961 | $3,664,474 | $4,722,040 |
| Value of Copper | $1,062,680 | $1,122,219 | $1,374,103 | $1,281,118 | $1,581,062 |
| Wages paid | $1,286,265 | $1,234,904 | $1,698,184 | $1,830,526 | $2,357,889 |
| Men employed, number | 1,680 | 1,796 | 2,156 | 2,439 | 2,850 |




Map showing location of Sudbury, Cobalt, Porcupine and Kirkland Lake, Ontario

**The nickel mining concerns carrying on active work in Ontario are:—**

| Name of Company. | Name of Mine. | Location. | P.O. Address of Manager, etc. |
|---|---|---|---|
| Canadian Copper Company | Creighton, Crean Hill, No. 2, etc. | Sudbury | Copper Cliff |
| Mond Nickel Company, Ltd. | Victoria, Garson | " | Coniston |
| Holmes and Wilson | Murray, Whistle, etc. | " | Toronto |
| E. F. Pullen | Alexo | Dundonald Tp. | Cochrane |

**Copper.**—The copper product of Ontario for 1912 was 11,126 tons, all of which save 10 tons was from the nickel-copper mines of Sudbury. A quantity of copper ore containing about 7 tons of metal was encountered in the workings of the Timiskaming silver mine at Cobalt, and the remaining 3 tons of non-Sudbury origin was obtained by the Dane Mining Company from a prospect near the station of that name on the T. and N. O. railway.

According to the figures supplied the Bureau by the nickel companies, the 41,925 tons of Bessemer matte turned out by the blast furnaces and converters of Sudbury contained 33,537 tons, or 80 per cent. of nickel and copper. Of this 1,069 lb. per ton or 53.45 per cent. was nickel, and 530 lbs. or 26.5 per cent. copper. Calculated on the quantity of ore smelted, 725,065 tons, the resulting matte showed the ore to contain 3.09 per cent. nickel and 1.53 per cent. copper. These figures, of course, take no account of losses of metal at any stage of the process of treatment. There is probably an appreciable loss of copper during heap-roasting of the ore in the open air, due to the leaching action of rain or snow falling upon the heaps; also a loss in the smelting itself.

**Platinum and Palladium.**—It is known that the Sudbury ores carry not only nickel and copper, but also a proportion of the precious and rarer metals, including gold, silver, platinum and palladium. Cobalt is likewise a constituent, but since the opening up of so prolific a source of supply of this metal in the silver mines of Cobalt, there is no inducement to recover the small proportion of cobalt contained in the Sudbury pyrrhotites. The rare metal rhodium, which is almost invariably contained in crude platinum to the extent of about 2 per cent., and which is at present worth $5 per gram, or $155 per ounce, is also present in these ores, and a little is said to be produced in the United States, partly from platinum sand, and partly from Canadian and other copper bullion.* Another rare metal, ruthenium, an accompaniment of the mineral iridosmine, is also said to occur in the copper ores of Sudbury.†

The platinum is present in the unaltered ores of Sudbury as sperrylite, or arsenide of platinum, and it has been definitely ascertained by T. L. Walker and Charles W. Dickson, to be associated with the chalcopyrite. The increasing demand for platinum, due to its extensive use for laboratory utensils, and also to its employment of late in the manufacture of jewellery, has caused a very decided rise in price, which went up from $21.27 per ounce in 1908, to $43.62, in 1911, remaining at about the same figure in 1912. There has been little or no increase in the supply, the bulk of which, about 300,000 ounces annually, comes from the Ural mountains in Russia. Colombia, with 11,750 ounces in 1912, ranks second as a producer, and smaller quantities are recovered in the placers of northern California, western Oregon, and British Columbia. Under these circumstances any source of supply is important.

Through the courtesy of the International Nickel Company, it is learned that during the six years, 1907 to 1912, inclusive, 2,366.47 ounces of platinum, and 4,216.482 ounces of palladium were recovered at the Orford refining works of that company in New Jersey, while refining the mattes produced by the Canadian Copper Company from the nickel-copper ores of the Sudbury district. No part of this production was previously reported to the Bureau, and hence it has not been covered by statistics previously issued. Under these circumstances, and although not strictly correct, the figures for the six years have been included in those for the year 1912, as the only practicable method of incorporating them in the official record of production. The platinum has been valued at the average price for the several years, and the palladium has been accorded the same figure. The former amounts to $80,736, and the latter to $147,235.

Palladium is a white metal, intermediate in colour between platinum and silver. In hardness it is about equal to platinum. It is malleable, ductile, sectile, and dissolves in nitric acid. Palladium finds a use in parts of astronomical instruments, in watch-making, dental work, and in soldering platinum metals. Not being altered or discoloured by exposure to air or hydrogen sulphide, it is often used for plating metal ware. The demand is greater than the supply.

It should be added with regard to this production of platinum and palladium, and also gold and silver from the same sources, that owing to certain residues from ores from other districts and of different character, which form part of the smelting charge at the Orford works, along with the nickel-copper mattes, it cannot be stated with absolute definiteness that the elements in question are wholly derived from the Sudbury ores; it is, however, believed that they are largely traceable to the latter.

**Iron Ore.**—Iron ore was shipped from three mines during the year 1912—Moose Mountain, Bessemer, and Helen—amounting to 117,357 tons. The Moose Mountain and Bessemer ore is magnetite, while the Helen ore is hematite. The production was considerably smaller than in 1911, when it was 175,631 tons. The Algoma Steel Corporation was actively engaged in developing the Magpie mine, and in installing the roasting plant for the treatment of the sideritic ore of which the deposit is composed. Complete success has not yet been achieved by the process, and the works are not at present in full commercial operation. The Atikokan Iron Company operated the Atikokan mine (magnetite) for a time, but shipped no ore, and the old Belmont or Ledyard mine, in the township of Belmont, Peterborough county, has been taken over by the Buffalo Union Furnace Company, who are carrying out a systematic development of the property. At the Moose Mountain a Grondal plant for magnetic concentration of the leaner portion of the ore body and the production of briquettes has been installed, and it is expected that both ore and briquettes will be placed on the market during the present year. Of the shipments from the Moose Mountain about 35,000 tons were taken from the stock pile, the remainder being mined during the last four months of the year. Some

*The Production of Platinum and Allied Metals in 1911, by Waldemar Lindgren, U. S. Geol. Survey, p. 19.
†Ibid, p. 19.

45,000 tons were sent to the Columbus Iron and Steel Company, Cleveland, Ohio; 5,000 to the Standard Iron and Steel Company, Deseronto, Ont., and 1,263 tons of briquettes were forwarded to Key Harbour, and held there, as against sales for 1913. Mr. J. W. Evans, of the Tivani Electric Steel Company, Limited, did considerable development work at the Orton mine in Hastings county, the ore of which carries 1 to 3 per cent. of titanium. It is Mr. Evans' intention to utilize this ore in the manufacture of steel by means of an electric furnace, which he has himself devised.

The following is a list of the iron mining companies at work last year:—

**Producing Iron Mines in Ontario.**

| Name of Company. | Name of Mine. | Locality. | P.O. Address of Manager, etc. |
|---|---|---|---|
| Moose Mountain, Limited | Moose Mountain | Hutton township | Sellwood. |
| The Canada Iron Mines, Limited | Bessemer | Hastings county | Trenton. |
| The Algoma Steel Corporation, Limited | Helen | Michipicoten | Helen Mine. |
| The Algoma Steel Corporation, Limited | Magpie | Michipicoten | Magpie Mine. |
| Buffalo Union Furnace Company | Belmont | Peterboro' county | Cordova Mines. |
| Atikokan Iron Company Limited | Atikokan | Thunder Bay | Port Arthur. |
| Tivani Electric Steel Company, Limited | Orton | Hastings county | Belleville. |

United States. The proportion of Ontario ore used in making pig iron in this Province is not increasing. On the contrary, it is decreasing steadily. In 1901 it amounted to 56 per cent.; in 1903 it fell to 22.5 per cent.; in 1905 to 19.3 per cent.; rose in 1907 to 23.6 per cent.; in 1909 to 28.7 per cent., and fell again in 1910 to 17.4 per cent.; in 1911 to 7.3 per cent., and in 1912 to 6.3 per cent.

The development of the iron mines of the Province is not keeping pace with the expansion of the iron smelting industry. For this there are several reasons. One is the ease with which supplies of iron ore of known quality and required composition can be procured from the Lake Superior region south of the line, and another is the comparatively small number of mines which have yet been opened in this Province. There are many iron ranges in Ontario, and if the conditions in Michigan and Minnesota afford any analogy there must be numerous bodies of workable ore contained in these iron-bearing rocks. The fact remains, however, that only a few have yet been located, and it seems as if much energy, skill and money must be expended in the search for ore bodies before the iron ore resources of the Province will be placed in a position to respond to the requirements of the smelting trade.

**Pig Iron and Steel.**—From the blast furnaces of Ontario last year there was turned out 589,593 tons of pig iron, having a value of $8,054,369, the pig being worth at the furnace on an average $13.66 per ton. Of the product, 567,892 tons were coke iron, and 21,701 tons charcoal iron, the latter being made at the Standard Iron Company's furnace at Deseronto. Of the nine furnaces in the Province, eight were in blast as follows:—Algoma Steel Corporation, Limited, Sault Ste. Marie, 3; Canada Iron Corporation, Limited, Midland, 2; Steel Company of Canada, Limited, Hamilton, 2; Standard Iron Company, Limited, Deseronto, 1. The Atikokan Iron Company's furnace at Port Arthur was idle throughout the year. Steel to the amount of 457,817 tons, valued at $8,071,339, was made by the Algoma Steel Corporation and Steel Company of Canada, in the manufacture of which pig iron, produced by these companies, to the extent of 312,709 tons, was utilized, besides 17,372 tons of pig iron purchased from other makers. The number of workmen employed in the making of pig iron only was 846, to whom wages were paid aggregating $636,420. This does not include employees in the steel-working departments, who numbered 2,179. Bessemer and basic steel are made at Sault Ste. Marie; basic open hearth at Hamilton. Electro Metals, Limited, Welland, carry on the manufacture of ferrosilicon in electric furnaces, of which they had five in operation during the year. They employed one hundred men and paid out in wages the sum of $70,000.

To produce the above quantity of pig iron, 1,133,660 tons of iron ore were charged into the furnaces, along with 22,252 tons of scale and mill cinder. Of this quantity of ore only 71,589 tons were the product of Ontario mines, all the rest being ore imported from the

Particulars of the pig iron and steel manufacture for 1912 are given in the following figures, and for the sake of comparison, for the year 1911 as well:—

| | 1911. | 1912. |
|---|---|---|
| Ontario ore smelted, tons | 67,631 | 71,589 |
| Foreign ore smelted, tons | 848,814 | 1,062,071 |
| Scale and mill cinder, tons | 18,476 | 22,252 |
| Limestone for flux, tons | 275,628 | 305,509 |
| Coke for fuel, tons | 577,388 | 660,248 |
| Value of ditto | $2,367,704 | $2,584,766 |
| Charcoal for fuel, tons | 1,666,897 | 1,886,748 |
| Value of ditto | $158,354 | $157,597 |
| Pig iron product, tons | 526,610 | 589,593 |
| Value of ditto | $7,716,314 | $8,054,369 |
| Steel product, tons | 361,581 | 457,817 |
| Value of ditto | $9,505,013 | $8,071,339 |
| Workmen employed, number | 3,633 | 2,925 |
| Wages paid | $2,927,573 | $2,383,029 |

The steady growth of the pig iron and steel making industry the past five years is sufficiently shown by the following table:—

**Production of Iron and Steel in Ontario, 1908 to 1912.**

| Schedule. | 1908 | 1909 | 1910 | 1911 | 1912 |
|---|---|---|---|---|---|
| Ontario ore smelted, tons | 170,215 | 220,307 | 143,284 | 67,631 | 71,589 |
| Foreign ore smelted, tons | 342,747 | 543,544 | 678,890 | 848,814 | 1,062,071 |
| Limestone for flux, tons | 179,741 | 226,991 | 248,750 | 275,628 | 305,509 |
| Coke, tons | 322,817 | 436,707 | 471,493 | 577,388 | 660,248 |
| Charcoal, bush. | ...... | 973,413 | 1,133,419 | 1,666,897 | 1,886,748 |
| Pig iron, tons | 271,656 | 407,013 | 447,351 | 526,610 | 589,593 |
| Value of pig iron | $4,390,839 | 6,301,528 | 6,975,418 | 7,716,314 | 8,054,369 |
| Steel, tons | 172,108 | 296,031 | 331,321 | 361,581 | 457,817 |
| Value of steel | $4,397,082 | 6,759,960 | 7,855,407 | 9,505,013 | 8,071,339 |

From the figures given for the operations of 1912 it would seem that, disregarding scale and mill cinder, 1.92 tons of ore were required to produce one ton of coke pig iron, also .53 ton of limestone, and 1.16 tons coke. For a ton of charcoal pig, the materials were, 1.90 tons ore, .114 ton limestone, and 8.35 bushels charcoal.

Following are the blast furnace companies producing pig iron in Ontario:—

**Blast Furnaces in Ontario.**

| Name of Company. | No. of Furnaces. | Fuel Used. | Location. |
|---|---|---|---|
| Algoma Steel Corporation, Limited | 3 | Coke | Sault Ste. Marie. |
| Steel Company of Canada, Limited | 2 | " | Hamilton. |
| Canada Iron Corporation, Limited | 2 | " | Midland. |
| Atikokan Iron Company, Limited | 1 | " | Port Arthur. |
| Standard Iron Company, Limited | 1 | Charcoal | Deseronto. |

**Materials of Construction.**—Building operations in the towns and cities of Ontario were again active, and there was an increased production of brick and stone. At the same time, however, the output of Portland cement fell off slightly, and there was a decrease in the quantity of lime produced.

**Brick.**—Returns to the Bureau show that the brick kilns of the Province turned out 385,000 M common brick in 1912, valued at $3,178,250, as against 354,546 M in 1911 worth $2,801,971—an increase in number of 30,545 M or 8.58 per cent., and in value of $376,279, or 13.42 per cent. It will be seen that the increase in cost was considerably greater than the increase in number, and this is further brought out by a comparison of the price per M which in 1911 was $7.90 and in 1912 $8.20. It is a truism now to state that the cost of living has gone up of late years; but common building brick, which in this country and climate may fairly rank as a necessary of life, well illustrates the tendency to higher levels of cost. In 1901 ordinary brick were worth $5.73 per M.; in 1905 the price had risen to $7.75; in 1909 it was $7.78; in 1911, $7.90, and in 1912, $8.20.

The manufacture of paving brick does not seem to be increasing in Ontario. Objection is taken to them because of their noisiness, and if they are not well made of suitable material, they fail to provide a durable pavement. The value of their production last year was $78,195, as against $86,685 in 1911. Terra cotta, worth $137,239 and fancy brick valued at $6,552, made up a total of $221,986.

Pressed, or re-pressed, brick is highly esteemed for its colour and finished appearance, and the number made rose to 65,598 M in 1912 valued at $634,169, as compared with 52,764 M in 1911 valued at $564,630.

About 40 per cent. of all the brick in the Province is manufactured in the yards on the outskirts of Toronto, which is a city of brick, and in which many millions of dollars have been spent during the last few years in building operations. In capacity these plants range upwards from two million brick per annum. Some turned out five million in 1912, some eight million, one fifteen million, and one—the Don Valley Brick Works—upwards of forty-three million. The average output of 23 yards was 6,900,000 brick. The local supply was insufficient last year to meet the demand, and quantities were shipped in from outside points.

**Sewer Pipe.**—Three sewer pipe manufacturing companies turned out a total of $464,627 worth of pipe last year. This was an increase of $54,563 over the production of 1911. The rapid growth of the towns and cities of Ontario provides a good market for the output.

**Pottery.**—The manufacture of pottery from Ontario clays is not keeping pace with the expansion experienced by other branches of the clay-working industry. Only the coarser and commoner articles, such as flower-pots, hanging baskets, jardinieres, etc., are made from the native clay, any finer varieties of ware requiring the use of imported material. It is not to be wondered at that in a region such as Ontario where there are no coal beds with their seams of fire-clay, and where glaciation has been so active a force in the formation of the present surface, there should be a scarcity of clays sufficiently free from fluxing agents to be suitable for fine porcelain and chinaware. Kaolinic clays have been reported from the valleys of several of the rivers running down the James Bay slope, but in the absence of transportation facilities no attempt has yet been made to test their adaptability for pottery purposes. The value of the pottery turned out by the half dozen potteries reporting their production in 1912 was $52,445, as compared with $50,500 in 1911.

**Lime.**—The output of lime in 1912 was apparently less than in 1911, being 2,297,525 bushels, worth $381,672, as against 2,469,773 bushels, valued at $402,340. Little difficulty is experienced in obtaining lime for any purpose in the older parts of the Province, where limestone occurs abundantly and in strata of various ages and differing composition. Nearly pure carbonate of lime can be procured in some parts; elsewhere the rock contains magnesia from small quantities up to proportions sufficient to constitute a dolomite. All varieties are used for burning into lime, the idea once prevalent that magnesia injured the quality of the product being now no longer generally held. Formerly, much of the production was from small kilns operated by farmers and their sons during their spare time, or when other work was not pressing; now the number of kilns is smaller, but the individual output has increased. In short, the modern tendency towards concentration of industrial effort has made itself felt in lime-making, as well as in nearly all other kinds of manufacture.

**Stone.**—The stone quarried in Ontario is varied in character, and is used for widely different purposes. For construction material, limestone, sandstone and marble are employed; for use as a flux, limestone is required; for roadmaking, limestone and so-called "trap." Granite and gneiss are also used both in blocks and crushed for building and other work. Limestone, however, largely preponderates. An industry is being developed on the basis of the marbles found in the neighbourhood of Bancroft in the county of Hastings. The serpentines of Darling township, of varying shades of green, are also capable of producing very handsome effects. In value, the stone raised last year amounted to $953,839, an increase of $61,212 over 1911. For an account of the limestone deposits of Ontario, arranged by counties, reference should be had to Part II. of the Thirteenth Report of the Bureau of Mines, 1094, by Prof. W. G. Miller, Provincial geologist.

**Portland Cement.**—The Portland cement plants of Ontario last year produced 2,993,367 barrels of cement, worth, at the factory, $3,365,659, being a decrease in production as compared with 1911 of 17,482 barrels, and in value of $74,893. This check is the first which the industry has experienced since it was establisehd in 1891, every year hitherto having shown a decided advance over the preceding one. The average price per barrel also fell from $1,200 to $1,124. A feature of the year was the action of the Dominion Government in reducing the duty by one-half on cement imported from June 1 to October 31, inclusive. The reason assigned for this step was the inability of the plants in Ontario and Quebec to supply the urgent demand for cement from Saskatchewan, Alberta and the west generally, arising not so much from shortness of supply as from the congestion of freight traffic on the railways.

**Arsenic.**—From the silver-cobalt ores treated in Ontario refineries there was produced and shipped 3,927,347 pounds of white arsenic, which realized $79,297, or a little over two cents per pound. The theoretical percentage of arsenic in these ores is assumed to be 14.28, which, on the quantity of ore raised from Cobalt in 1912, would give 8,332,000 pounds of white arsenic. The difference between this quantity and the product actually marketed, must be set down for the greater part as waste. Little or no attempt to save the arsenic is made in the smelters of the United States to which much of the lower grade ore is shipped for treatment. The production of 1911 was 4,234,000 pounds, worth $74,609, the average value per pound being 1.75 cents. Since the close of 1912 there has been a marked advance in the price of arsenic, which is chiefly a by-product of the ores of other metals. There are large deposits of arsenical ore in Hastings county, which at one time were worked for their gold contents, but which have remained untouched since experience showed the values to have fallen below the profit line.

Arsenic is a most useful substance in the arts, being employed as a preservative of skins, as a pigment, in the manufacture of glass for the purpose of imparting brilliancy, but chiefly as the active agent in insecticides. As a constituent of Paris green and arsenate of lead, it plays an important part in controlling the insect pests which annually work havoc amounting to tens of thousands of dollars among the potato fields and apple orchards of Ontario.

**Iron Pyrites.**—No deposits of native sulphur, such as are found in Sicily and Louisiana, occur in this Province, yet there are very large supplies of sulphur locked up in the pyrrhotites of Sudbury and the iron pyrites of many other parts of Ontario's mineral regions. No attempt is being made, or in the present state of the metallurgical arts perhaps can be made, to recover the immense quantities of sulphur annually scattered to the winds in the fumes which ascend from the roast heaps of the nickel-copper companies of Sudbury. This sulphur is worse than wasted, because these acrid fumes blast and wither every green thing within their range, and when carried by contrary winds to centres of population are certainly objectionable. So long, however, as it costs more to entrap the sulphur and convert it into sulphuric acid or some other article of commerce than the price it would bring when sold, this waste is inevitable.

Five deposits of pyrite were worked last year, but from three only were shipments made. These were the mines of the Canadian Sulphur Ore Company of Queensboro, in Hastings county; Nichols Chemical Company at Sulphide, and the Buffalo-Brockville Mining Company at Brockville. The output from the last-named was small, and work ceased about the middle of July. No shipments were made by the Northern Pyrites Company, from their mine on Big Vermilion lake, near Graham, nor from the Helen mine by the Algoma Steel Corporation. The quantity shipped was 20,744 tons, valued at $71,043. This was considerably less than the output for 1911, which was 43,629 tons, worth $118,457.

The Nichols Chemical Company operate an acid-making plant at Sulphide, at which is used not only the ore from the company's own mine at the same place, but also ore purchased from other deposits worked in the neighbourhood. The ore from the Northern Pyrites and Helen mines when shipped goes to the United States for the manufacture of sulphuric acid, or for use in pulp and paper mills.

**Mica.**—The amber mica of Ontario and Quebec has long been highly esteemed by manufacturers, especially those of electrical apparatus, for its flexibility and high insulating efficiency. Nevertheless, mica mining in Ontario shows comparatively little progress from year to year. Its product is meeting with strong competition in the markets of the United States from the white mica of India, where wages are low, and whose mica finds much favour from the form in which it is placed on the market, namely, in small circular boxes or cartons of mica films. These are used in building up the micanite or board mica in sheets of any desired size, which has practically taken the place of the large natural sheets formerly regarded as indispensable, and for which a high price was demanded. The irregular and pocketty nature of the mica deposits here, too, has a tendency to deter systematic exploitation or the expenditure of large sums in development.

**Salt.**—The production of salt from the wells situated on the eastern shore of Lakes Huron and St. Clair and Rivers St. Clair and Detroit, remains at pretty much the same figure from year to year. In 1912 it amounted to 90,986 tons, valued at $450,251. The year previous the output was 88,689 tons, worth $430,835. Besides the ordinary uses of salt in the preparation of food products, a beginning has been made in its utilization as the raw material for a large and varied list of chemical manufactures. The Canadian Salt Company has begun the operation of a plant on the Detroit river, near the eastern boundary of the town of Windsor, having good railway connections and a shipping dock on the Detroit river channel bank. The products at present made are bleaching powder and caustic soda. The former is used for bleaching paper and fabrics and also for sterilization of water and sewage; the latter mainly in the manufacture of soaps, also in the refining of certain grades of oil and glue, and in the manufacture of lye. It is proposed to add other products to the list. The market for the company's goods is found in Canada, the rate of duty preventing export to the United States. There is no protection on these articles in Canada. The number of hands employed last year was thirty-eight, and the wage bill amounted to $23,859.

**Petroleum.**—A steady drying up of the sources which feed the petroleum wells of the Province has been in progress for a number of years. That the influences which cause this diminution are still in operation is manifest from the fact that the output of crude petroleum last year fell to 8,432,730 imperial gallons, or 240,-

935 barrels, as compared with 10,102,081 gallons, or 288,634 barrels in 1911, a reduction of 16.5 per cent. The production of 1912 was only 24 per cent. of that for 1904, when the yield was 34,912,360 gallons, or 997,496 barrels.

**Natural Gas.**—The natural gas field of the Province last year yielded 12,414 million cubic feet of gas, which is valued in the returns made to the Bureau at an aggregate of $2,268,022, being at the rate of more than 18 cents per thousand cubic feet. In 1911 the output was valued at $2,186,762. The retail price of gas is on an average nearly double this figure, but the valuation is not based on the cost to the ultimate consumer, but on the price obtained by the producer, for the most part at the mouth of the well. Naturally, the users of gas in the towns and cities of southwestern Ontario must pay for the cost of piping and distribution, hence the price varies according to distance from the point of production, and other circumstances. As has been remarked before in these Reports, gas is a most desirable fuel, and it would be highly in the general interest if it could be confined to domestic purposes, and not expended on such operations as the burning of lime and brick, or for the generation of steam.

# ONTARIO PRODUCTION OF METALS DURING FIRST NINE MONTHS OF 1913

Returns made to the Bureau of Mines under the Mining Act show that the production of metals and metalliferous substances from the mines and works of Ontario during the 9 months ending 30th September, 1913, was as follows. The changes as compared with the corresponding period of 1912 are also noted:

| Product. | Quantity. | Value. | Increase* or Decrease†. Decrease. |
|---|---|---|---|
| Gold, ozs. | 159,962 | $3,281,027 | *$2,163,692 |
| Silver, ozs. | 23,171,536 | 12,967,138 | *259,312 |
| Copper, tons | 9,237 | 1,311,681 | *169,605 |
| Nickel, tons | 18,233 | 3,825,633 | *457,196 |
| Iron Ore, tons | 143,979 | 314,590 | *213,306 |
| Pig Iron, tons | 440,954 | 5,792,022 | †259,956 |
| Cobalt Ore, tons | 71 | 12,917 | †44,697 |
| Cobalt and Nickel Oxides, lbs. | 740,089 | 290,597 | *113,811 |
| Lead ore, tons | 740,089 | 3,000 | *3,000 |

**Gold.**—The production is chiefly from Porcupine where the Hollinger and Dome are the leading mines. The latter is adding 40 stamps which will double its milling capacity. Porcupine Crown and McIntyre Porcupine also contributed considerable bullion. The total yield from the Porcupine mines was $3,106,250, leaving $174,777 as the product of outside areas. These were Long Lake (Canadian Exploration Co.), Swastika (Swastika Mining Co.), Kirkland Lake (Tough-Oakes), Larder Lake (Goldfields, Limited), and Sturgeon Lake (Northern Gold Reef).

**Silver.**—The production was slightly greater, both in ounces and value, than for the same period last year. The number of producing mines was 31; 27 being in Cobalt proper, 1 in Casey Township, 2 in Gowganda, and 1 in South Lorrain. Nipissing led with a total output of 4,387,765 ounces, followed by Coniagas with 2,662,678 ounces, LaRose with 1,903,345 ounces, and Cobalt Townsite with 1,826,422 ounces. Kerr Lake, McKinley-Darragh, Buffalo, and Crown Reserve were also well up. Of the product, 10,512,396 ounces was in the shipments of ore, 6,184,271 in concentrates, and 6,444,099 in bullion. By camps, Cobalt proper yielded 21,956,561 ounces, Casey 607,212 ounces, Gowganda 342,380 ounces, and South Lorrain 234,613 ounces; silver in auriferous ores 30,770.

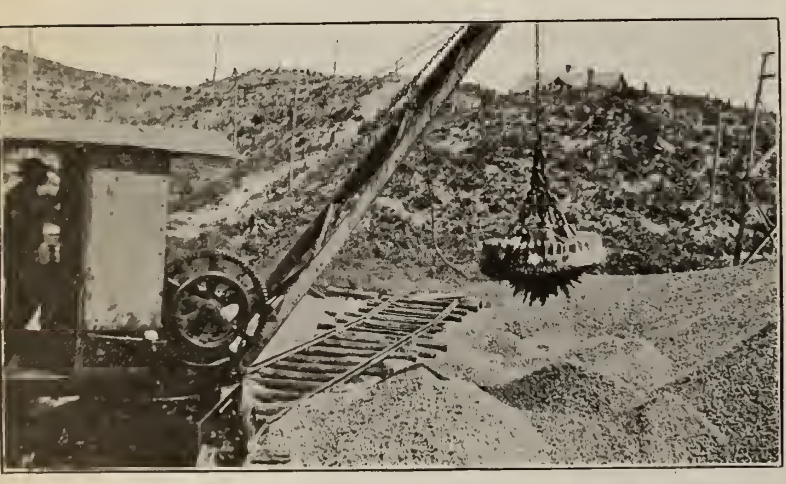
**Nickel and Copper.**—The production was in excess of that of any previous 9 months. There were raised 535,-

Moose Mountain Iron mine, Ont.

Moose Mountain Iron Mine, Ont.

265 tons of ore and smelted 569,898 tons. The Bessemer matte product was 34,243 tons, the estimated contents of which were 18,233 tons nickel and 9,237 tons copper. The Canadian Copper Company remains the principal producer, but the new and well-equipped smelter of the Mond Nickel Company at Coniston which is now in operation, will doubtless increase that company's output.

**Iron.**—There were five iron ore mines in operation, namely, the Helen, Magpie, Moose Mountain, Bessemer and Belmont. The Canada Iron Corporation concentration plant at Trenton is now at work on ore from the



Handling magnetite concentrate by electro-magnet
Moose Mountain, Ont.

Bessemer and Childs mines. At the Magpie mine the roasting plant is treating siderite, from which it expels the carbonic acid gas and sulphur, thus producing a first rate article for the blast furnace. If the process proves commercially successful, it will turn to account an immense quantity of sideritic material, hitherto but little regarded as a possible source of iron.

Four blast furnace companies produced 11,967 tons less pig iron than was made during the corresponding term of 1912, and the average value per ton declined from $13.36 to $13.16. At Port Colborne the new furnace of the Canadian Furnace Co., a subsidiary concern of the Buffalo Union Furnace Co., was blown in on 27th September. The plant has a capacity of 300 to 325 tons of pig iron per day.

**Cobalt Oxide, etc.**—The output of cobalt and nickel oxides, being refined by-products of the Cobalt silver ores, is steadily increasing, and had a value of $176,786 greater than in the first 9 months of last year. A bounty is paid by the Ontario Government of six cents per pound on the metallic contents of refined cobalt oxide and nickel oxide.

Onaping Falls, Sudbury District, Ont.

## MANAGEMENT OF THE GEOLOGICAL CONGRESS

Mr. R. A. F. Penrose, jr., in an article published in the Journal of the Franklin Institute, says: "The management of the Congress by the Canadians was excellent. Everything was done that could add to the comfort, interest, and pleasure of the members. The people of Toronto and of Canada in general were most hospitable and kind, and no member of the Congress could have left Canada without the pleasantest recollections of its people and their boundless hospitality."

## USES OF NICKEL*

An alloy of copper, nickel and zinc, called packfong, has been known to the Chinese since time immemorial, and it is stated that an alloy containing 77.58 per cent. of copper, 20.04 per cent of nickel and 1.72 per cent. of impurities was used for coinage by Ethydemos, who reigned over Bactria about 235 B.C.; so that alloys of nickel were used long before the pure metal had been separated from its ores. It is interesting to note that the Bactrian alloy is closely like that now used for subsidiary coins in the United States.

Pure nickel is employed in small amounts for a number of purposes because of its strength and durability and its white colour, which resists tarnishing. For these reasons several nations have introduced it for coinage, e.g., France, Switzerland and Turkey, and its cleanness and hardness contrast very favourably with copper or bronze, on the one hand, and silver on the other. It is rather surprising that Canada, which produces two-thirds of the nickel of the world, should still retain its ugly bronze cents and troublesomely small silver five cent pieces. These and the ten cent piece should certainly be replaced by pure nickel coins.

One might expect also that iron kitchen utensils, which constantly grow black and rusty, might well be made of the clean and white, and untarnishable metal nickel. For many purposes steel is now plated with nickel to preserve it from rusting.

Though the importance of pure nickel is likely to grow, the chief use of the metal is in the production of alloys, particularly nickel steel, in which the greater part of the nickel now refined is employed.

By the kindness of Dean Galbraith, of the Applied Science Department of the University of Toronto, and of Mr. C. R. Young, the following data bearing on the use of the alloy may be given:

**Comparison of Carbon and Nickel Structural Steels.**
Based upon Average Present Practice (1912).

| | Medium Carbon Steel. | Medium Nickel Steel. |
|---|---|---|
| Percentage of Carbon | 0.20 | 0.38 |
| Percentage of Ni | 0 | 3.50 |
| Elastic limit (lbs. per sq. in.) | 30,000 (Min.) | 60,000 (Min.) |
| Ultimate tensil strength (lbs. per sq. in) | 60,000 (Min.) | 105,000 (Min.) |
| Modulus of elasticity | 29,000,000 | 30,000,000 |
| Safe working stress in tension (lbs. per sq. in.) | 16,000 | 28,000 |

The alloy of nickel with iron is no novelty, since all native iron of terrestrial as well as meteoric origin contains nickel. The telluric iron from Ovifak and elsewhere in Greenland contains, according to Dana, from .34 to 6.50 per cent. of nickel, with an average of 2.11 per cent.; and meteoric iron from various sources runs much higher, containing, according to the same authority, from 3.81 to 59.69 per cent. In Greenland such iron was long ago utilized by the Esquimo, who used to hammer off flakes of it from the large masses left on the surface by the weathering of the parent basalt, making from them knives and spear points. Peary, with his supplies of modern steel tools and weapons, put an end to this industry, at least for the present, and removed the largest masses of telluric iron to the United States.

Steel containing from 2½ to 3½ per cent. of nickel has certain of its properties greatly improved, so that for many purposes it is replacing ordinary structural steel. Its value for armour plate has long been known, and the rivalry of the great maritime nations in the building of Dreadnoughts is one of the causes for the recent increased demand for nickel. It is stated by Mr. Monell, president of the International Nickel Company, that the growth of the motor vehicle business is important in this respect also; and its value for bridge building is shown by the selection of nickel steel for the rebuilding of the Quebec bridge, which fell so disastrously some years ago.

**Approximate Saving in Weight and Cost of Bridges Effected by Use of Nickel Steel.**

Mixed Nickel and Carbon Steel—
  Saving in weight up to 25 per cent.
  Saving in cost up to 17 per cent.
Nickel Steel throughout—
  Saving in weight 10 to 30 per cent.
  Saving in cost up to 12 per cent.

Alloys much higher in nickel are employed for special purposes, such as Invar, steel with 36 per cent. of nickel, which has the property of varying very little in length with change of temperature, making it of great value for tapes to be used in the accurate chaining necessary in geodetic surveys.

**Monel Metal.**—Next to nickel steel the most important alloy is monel metal, so named for Mr. Ambrose Monell, of the International Nickel Company, consisting of 68 to 72 per cent. of nickel with the balance copper, except for trifling impurities (0.5 to 1.5 per cent. of iron, 0.073 to 0.15 per cent. of carbon, and 0.014 per cent. of sulphur). The proportions of nickel to copper are those of the ores now worked by the Canadian Copper Company, so that the alloy may be produced directly from the matte, at a cost not much greater than that of copper. The alloy is silver white and takes a brilliant polish, which slowly turns greyish on exposure. It melts at 1350 degrees C., has the same specific gravity as copper and can be cast or rolled and treated in various ways like copper or steel, but is distinctly stronger than ordinary steel or than manganese bronze. The Orford Copper Company in a circular to the trade makes the following statements as to strength, etc.:

| | Castings. | | 1 inch rods. Rolled. annealed and cold drawn. | ½ inch plates. |
|---|---|---|---|---|
| | Grade C. | Grade D. | | |
| Tensile strength (lbs. per sq. in.) | 70,000 | 85,000 | 110,000 | 90,000 |
| Elastic limit (lbs. per sq. in.) | 27,000 | 40,000 | 80,000 | 45,000 |
| Elongation in 2 in. (per cent.) | 30 | 25 | 25 | 30 |
| Reduction in area (per cent.) | 35 | 25 | 50 | 60 |

*From report on Nickel Industry, by A. P. Coleman, published by Mines Branch, Ottawa, 1913.

They are prepared to furnish ingots, sheets, rods, bars, castings, tubes, and wire of this alloy; and it is stated that the sheets are as flexible and malleable as copper, and that wire may be drawn of all sizes down to 0.004 in., the finest being as soft and pliable as silk thread.

It is not alone strong but resists corrosion, and so may be used for many purposes for which steel is unfitted, such as propellers, boilers, and roofs exposed to acid fumes. During 1908 about 300,000 square feet of monel metal sheets were used to roof the Pennsylvania tunnel station in New York City.

Because of its great power nickel has long been alloyed with copper, zinc, etc., to produce a white metal imitating silver, and called by various names such as German silver, Brittania metal, or argentan. These alloys are familiar from their use in household articles, such as spoons, forks, etc., which are generally plated with silver.

T. W. Gibson, Deputy Minister of Mines, Ont.

## MOND NICKEL CO. BUYS LEVACK PROPERTIES.

According to the Financial Times, the Levack nickel properties in the Sudbury district have been purchased from Messrs. R. J. Tough, Rinaldo McConnell and Jas. Stobie, by the Mond Nickel Co. for $750,000. The property has an area of 1,600 acres and is 30 miles west of Sudbury.

"The Mond people secured an option of this group of properties some months ago and have since had six diamond drills constantly proving up the ore bodies. It is learned that they have over two million tons of ore proven in the bodies drilled. The sum of $40,000 was paid by the Mond Company when the option was granted them and under the terms of the agreement the balance and final payment of $500,000 is due in December, unless amended arrangements are entered into. Singularly, the Mond people secured an option of the same properties, ten years ago for a much smaller amount, and at the time paid $10,000 on account. The big Levack properties were discovered and located about the year 1882, by one of the present owners, James Stobie, at that time of Sudbury, but now of Portfock. Associated with Mr. Stobie now in the ownership of the property is Rinaldo McConnell, of Ottawa, and R. J. Tough, of Toronto.

"The Mond is one of two big nickel producing companies in Canada, the other being the International. A third company was organized this year, the Canadian Nickel Corporation, backed by Dr. Pearson and other interests identified with him in the Brazilian Traction and other enterprises. The company acquired a number of mines, among them the Murray, and was capitalized at $10,000,000 debenture stock, and $20,000,000 common stock. Plans for flotation of the company's securities in London, however, have been held up by the disturbed condition of the market, and little has been heard of the enterprise lately."

W. H. Hearst, Minister of Mines, Ont.

## DIVIDENDS PAID BY ONTARIO MINING COMPANIES IN PERIOD JAN. 1 to NOV. 1, 1913.

| Company. | Amount. |
|---|---|
| Buffalo | $820,000 |
| Cobalt Lake | 165,000 |
| Cobalt Townsite | 144,000 |
| Coniagas | 1,080,000 |
| Crown Reserve | 879,982 |
| Hollinger | 900,000 |
| Kerr Lake | 450,000 |
| La Rose Consolidated | 936,941 |
| McKinley-Darragh-Savage | 1,033,937 |
| Nipissing | 1,800,000 |
| Seneca-Superior | 251,412 |
| Timiskaming and Hudson Bay | 116,415 |
| Timiskaming | 150,000 |
| Trethewey | 100,000 |
| Wettlaufer-Lorrain | 141,758 |
| (U.S. company controlling Canadian Copper Co.) | |
| International Nickel, preferred | 405,000 |
| International Nickel, common | 3,230,000 |

# SMELTING THE COBALT SILVER ORES*

By A. A. Cole.

The shipments of Cobalt ores during 1912 were mostly treated by the same smelters as received the production of the previous year. In Canada the bulk of the output went to the—

1. Canadian Copper Company, Copper Cliff, Ont.
2. Canada Smelting & Refining Company, Orillia, Ont.
3. Coniagas Reduction Company, Thorold, Ont.
4. Deloro Mining & Reduction Company, Deloro, Ont.

A few consignments were also made to three new plants which commenced operations during the year, viz.:

5. Buffalo and Ontario Smelting and Refining Co., Kingston, Ont.
6. Dominion Refineries, North Bay, Ont.
7. Metals Chemical Company, Welland, Ont.

Of the foreign shipments, all went to the United States with the exception of a few high grade shipments from the Crown Reserve mine to the Saxon Government. The American smelting companies in this market were:

8. American Smelting and Refining Company, at their works at Perth Amboy, Omaha, and Denver, and
9. The Pennsylvania Smelting Company, Carnegie, Pa.

While occasional consignments were taken by the

10. Balbach Smelting and Refining Company, Newark, N.J., and the
11. United States Metals Refining Company, Chrome, N.J.

As most of the Canadian plants produce refined cobalt oxide the disorganized state of the market for this material has made it impossible at times to profitably dispose of their output, and they therefore welcomed a betterment of the market towards the end of the year.

When the smelters started treating Cobalt ores, cobalt oxide was selling at $2.50 per pound, but the consumption was so limited that the production from the Cobalt district soon glutted the market. Now the retail price quoted in New York is about 90c. per pound, with an import duty of 25c. per pound. It is selling in England and Europe at from 2s. 2d. to 3s. per pound, or about 68c., and the price paid to the smelters is necessarily still lower.

The Canadian smelters now supply practically the entire world's market with cobalt oxide of excellent grade, and if new uses are found for cobalt they are ready to increase the output and supply the demand.

The Canadian Copper Company decided to close down its Cobalt plant and received its last shipment of cobalt ore towards the end of October. Since that time operations have been continued simply as a final clean up to recover the values tied up in ore on hand, residues, furnace bottoms, etc.

The small smelting plant at North Bay is bidding for ore rich in cobalt and low in silver.

The smelting schedules were practically unchanged from those in effect in 1911.

The ores shipped to the smelters will average about 1,000 ozs. silver per ton, between the limits of 75 ounces and 7,000 ounces. A few exceptional shipments are known to have assayed even above this latter figure, the highest shipment recorded being one of 20 tons from the Crown Reserve mine, which assayed 8,903 ounces silver per ton.

### Coniagas Reduction Company, Ltd.

The Coniagas Mines, Limited, of Cobalt, Ont., owns the issued capital stock of the Coniagas Reduction Co., Ltd., except six shares issued to directors to qualify.

The head office of the company is at St. Catharines, Ont., but the smelter is situated at Thorold, six miles west of Niagara Falls. The company's property comprises 160 acres, of which the smelter occupies about four, with a frontage of 1,500 feet on the Welland Canal. It is also served by the Grand Trunk, and Niagara, St. Catharines and Toronto Railways.

Construction of the smelter started March, 1907 and actual smelting commenced May, 1908. Erected originally for the treatment of ores from the Coniagas mine, Cobalt, Ont., its capacity is sufficient to allow of the smelting of a certain amount of other silver ore from the same district.

The products of the smelter are silver, white arsenic, and the oxides of cobalt and nickel, either combined or separated.

**Treatment.**—The ore is first crushed, then ground in a Krupp ball mill, and sampled by a Vezin automatic sampler, two independent samples being made. The fine ore is smelted with limestone, iron ore, and other substances. The separated silver is cast in anodes and refined electrolytically, while the nickel and cobalt are recovered as speiss, which is worked up for nickel and cobalt oxides. These are put on the market either combined or separately.

The combined oxides will assay 40 to 50 per cent. metallic cobalt, and 15 to 25 per cent. metallic nickel, depending on the grade of the ore treated. The oxide of cobalt will run from 60 to 76 per cent. metallic cobalt according to the call of the market, the only impurity being nickel which will run from .5 to 1.15 per cent.

The arsenic fume from the fume and dust flues and collectors is worked up for refined white arsenic, which will assay over 99 per cent. pure.

The actual output from the smelter since the commencement of operations has been as follows:

**Operations of Coniagas Reduction Co.**

| Year. | Ore Treated, Tons. | Silver, Fine, Ozs. | Cobalt Oxide, Tons. | Nickel Oxide, Tons. | White Arsenic, Tons. |
|---|---|---|---|---|---|
| 1908 | 266.8 | 360,683 | 5.5 | 1.5 | 13.5 |
| 1909 | 1,116.9 | 1,659,604 | .9 | .. | 100.0 |
| 1910 | 2,017.25 | 3,485,243 | 53.8 | 13.2 | 557.7 |
| 1911 | 2,821.50 | 5,770,271 | 60.5 | 17.3 | 766.1 |
| 1912 | 2,288.77 | 4,824,632 | 129.0 | 50.7 | 636.7 |
| | 8,511.22 | 16,100,433 | 249.7 | 82.7 | 2,074.0 |

*Extract from report of mining engineer T. & N. O. Ry. Commission.

Power used at the plant is transmitted from Niagara Falls, and the plant requires from 200 to 300 horse power. The smelter has a monthly capacity of 450 tons of raw ore.

The limestone flux is obtained from Port Colborne, 20 miles distant, and the iron ore from Michigan.

The capacity of the arsenic works is about 1,000 tons per year.

The smelting schedule of the Coniagas Reduction Co., on the 1st January, 1913, was the same as has been effected since November 1st, 1911, and is in condensed form as follows:

**Schedule.**—Percentages of silver to be paid for on commercial assay of silver content per ton of 2,000 pounds as follows:

55 per cent. for 50 ounces and proportionate increase in percentage up to

73 per cent. for 200 ounces and proportionate increase in percentage up to

78 per cent. for 300 ounces and proportionate increase in percentage up to

84 per cent. for 500 ounces and proportionate increase in percentage up to

91.5 per cent. for 1,000 ounces and proportionate increase in percentage up to

92.5 per cent. for 1,500 ounces and proportionate increase in percentage up to

93.5 per cent. for 2,000 ounces and proportionate increase in percentage up to

95 per cent. for 3,000 and over.

Sampling to be at vendor's expense.

All ore purchased to be at a refining charge of 3/4 cent per ounce of silver content.

75 per cent. of amount 30 days after date of weighing and sampling reports.

25 per cent. of amount 90 days after the date of said report.

Price of silver to be determined by New York quotation as given by Messrs. Handy and Harman to Western Union Telegraph Company on dates of settlement.

### Deloro Mining and Reduction Co.

The Deloro Mining and Reduction Co. is a close corporation, controlled by Mr. M. J. O'Brien, owner of the O'Brien mine, Cobalt.

The smelter is located at Deloro, Hastings County, Ont., 1 1/4 miles by road from Marmora station, on the Canadian Northern Ontario Railway. The construction of a railway spur is contemplated early in 1913.

The plant was originally built and operated as an arsenic producer by the Canadian Goldfields, but was entirely remodelled in 1907 by the present owners, to smelt ores from the Cobalt camp, particularly those of the O'Brien mine. During the year 1908 a separate and extensive plant was added for the manufacture of cobalt and nickel oxides, and this has been in successful operation since May, 1910.

**Treatment.**—The ore is first ground fine and sampled by Snyder sampler and hand quartering. It is then charged in a 42 in. Allis-Chambers cupola furnace producing metallic silver, speiss, slag and argentiferous arsenic fumes. The fuel used is a good grade of coke and when flux is required a local limestone is used with an occasional addition of a little scrap iron.

The silver button, which is about 850 fine, is charged in a refining furnace, which brings it up to 996 fine.

The speiss is crushed and roasted in mechanically worked roasters, part going to an intermediate treatment and the other part direct to the oxide plant. In the intermediate treatment silver (999 fine) is extracted with cyanide, the residue reverting to the cupola.

The speiss going to the oxide plant is treated so that the cobalt and nickel go into solution. The liquor and residues are separated in filter presses, the latter being returned to the cupola. The cobalt and nickel are precipitated either separately or together. The cobalt oxide (black oxide) after washing, contains 70 per cent. metallic cobalt and under 1 per cent. nickel, while the combined oxides run from 40 to 45 per cent. cobalt, and 10 to 15 per cent. nickel.

The crude arsenic from the cupola and roasting furnaces is caught in arsenic chambers and bag houses from which it is transferred to the arsenic refining furnaces. After refining it is ground ready for commerce as the oxide, white arsenic. The silver-bearing residue is returned to the cupola.

There is usually a considerable slag revert, not only for the purpose of removing any contained silver, but also to assist in the fluxing of the ore.

The smelter has a daily capacity of from 12 to 14 tons of raw cobalt ore. The capacity of the oxide plant is 20 tons per month, but the enlargements that are nearing completion increase this capacity by one-third.

Power is supplied to the smelter by the Seymore Power Co., from Campbellford, over a 22-mile transmission line, at $20 per horse power. The operation of the plant requires from 300 to 400 horse power. There are 120 men employed at the works.

### Operations of Deloro Smelter.

| | |
|---|---|
| Ore treated .................. | 11,065 tons. |
| Silver Produced ................ | 20,339,860 fine ozs. |
| Cobalt and Mixed Oxides ...... | 500 tons. |
| Refined Arsenic ............... | 3,275 tons. |

The smelting schedule of the Deloro M. & R. Co., in force on the 1st January, 1913, is as follows:

**Schedule.**—Pay for 98 per cent. of the silver contents of the ore determined by commercial assay, on the following terms and conditions:

Treatment charge—$25.00 per ton of ore.

Refining charge—3/4 of a cent per ounce of silver contents on ore assaying 3,000 ounces and over per ton. One cent per ounce of silver contents on ore assaying 2,000 to 3,000 ounces per ton. 1 1/2 cents per ounce of silver contents on ore assaying less than 2,000 ounces per ton.

Terms of payment—Seventy-five per cent. of net proceeds at Handy and Harman's New York quotation, 30 days after completion; twenty-five per cent. of net proceeds at Handy and Harman's New York quotation, 90 days after completion of sampling.

Ore to be delivered in carload lots f.o.b. Marmora Station, C. O. Railway, and to be at shipper's risk until sampling is undertaken.

(To be continued.)

### DOME.

In our issue of November 1 we printed a list showing tonnages treated during each of several months. The figure for August should have been 10,720 tons instead of 12,720. Previous to October the largest tonnage treated in one month was 11,300.

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Our readers will regret to learn of the death of Major R. G. Leckie, of Sudbury, well-known among mining men and for years one of the most enthusiastic members of the Canadian Mining Institute.

# SWASTIKA AND KIRKLAND LAKE GOLD AREA

The geological map of Swastika and Kirkland lake gold areas, prepared for the Ontario Bureau of Mines by Messrs. A. G. Burrows and P. E. Hopkins, has been completed and is ready for distribution.

Accompanying the map are notes on the general geology and the ore deposits. The following paragraphs are extracts from these notes:

The rocks of the area are all referred to the pre-Cambrian.

**Keewatin.**—The oldest rocks recognized are the greenstones and their schistose derivatives. Their original constituents have generally been altered to secondary minerals. In the less disturbed parts they have the characteristic light greenish weathering surface of the typical Keewatin greenstone. Ellipsoidal and amygdaloidal structures are frequently shown. The predominating rock is a basalt, which can be seen along the railway cuttings east of Swastika and on the shores of Amikougami lake. A diabase is prominent on the north parts of Teck and Lebel townships.

Quartz-porphyry and other acid rocks occur less abundantly than the greenstone.

**Timiskaming Series.**—The Keewatin is overlain by a series of sedimentary rocks which have been folded in the older rocks. Owing to the similarity of these rocks to certain sedimentary rocks of Cobalt and Porcupine, they have been classified as Timiskaming. At two localities excellent unconformities have been found between the Timiskaming and the underlying Keewatin, namely on mining locations L. 1824 on Kirkland lake and on L. 2796 in the northwest part of Lebel township. The series occurs as a narrow band having a crescent shape, extending from Eby and Grenfell townships on the west to McVittie township on the east. Its greatest width of nearly three miles is near the line between Teck and Lebel townships.

The beds of the series are nearly always highly inclined and approximate an east and west direction, while the schistosity is often nearly northeast and southwest. The lower beds include quartzite, graywacke, slate and conglomerate, which have at times been altered to schists. There are also less altered rocks of the same type which are considered to be the upper portion of the series. The highest exposures are generally a hard conglomerate carrying abundant pebbles which often readily separate from the matrix. The pebbles are frequently stretched and the matrix rendered schistose. There is considerable variety in the pebbles, which include various greenstones, porphyries, an occasional granite, and numerous fragments of a bright red jasper, which give the conglomerate a striking appearance.

The series has been greatly impregnated with carbonate, which sometimes forms the major part of the rock. The weathering of the iron in the carbonate has given a rusted surface to much of the rock.

While it has not been definitely proved, it is thought that the series probably forms a syncline, with the older sediments altered to schist at the north and south of the fold, whereas the more readily recognized quartzite, greywacke and conglomerate are toward the centre. To the east of Mud lake the series is represented by the older schistose members with less conglomerate.

Very schistose sediments can be seen one-half mile south of the five-mile post on the line between Teck and Lebel townships. Easily recognizable greywacke occurs just south of No. 3 vein and conglomerate at No. 2 vein of the Tough-Oakes mine. A conglomerate, which is made up of a mass of pebbles closely packed together, can be seen one-half mile north of Gull lake on L. 2452.

**Light-Coloured Intrusives.**—There are several areas of light-coloured igneous rocks which occur in large volume. In the south part of the township of Otto there is a reddish hornblende or augite syenite. In the south part of Lebel township and the north part of Boston township there is a grey hornblende syenite. In the northwest part of Teck township there is a reddish hornblende granite. All these rocks intrude the Keewatin, but only the hornblende syenite in Lebel township was observed in contact with the Timiskaming, which it appeared to intrude.

**Lamprophyre.**—Lamprophyre dikes are common in the Keewatin and Timiskaming series. Narrow dikes of this rock, usually dark-coloured, cut the Keewatin along the railway southeast of Dane. Some reddish minettes can be seen north of Boston creek crossing.

**Feldspar Prophyry.**—There are dikes of reddish and greyish porphyry throughout the area which are believed to be the latest acid rock. These are sometimes only 20 or 30 feet wide; but occasionally the porphyry occurs over somewhat broad areas, as round the east end of the southeast bay of Kirkland lake.

### Veins of Swastika Area.

Two types of veins have been observed in the mapped area. Of these the earliest discovered are those near Swastika. These veins, which are of white quartz, are sometimes several feet wide. The gold occurs along line of contact of quartz and schist, or in fracture planes in the quartz along with iron pyrites. Calcite and crushed quartz occur in the fracture planes. Some molybdenite has been observed in the veins on the Lucky Cross property. These productive veins occur in the Keewatin near the contact with feldspar-porphyry.

Two mills have been in operation near Swastika, there being a five-stamp mill at the Swastika mine and a ten-stamp mill at the Lucky Cross mine. There has been considerable underground development at both these properties.

### Veins of Kirkland Lake Area.

About six miles northeast of Swastika is the Kirkland lake area. The principal rock is greywacke and conglomerate of the Timiskaming series. These have been intruded by lamprophyre and later by feldspar-porphyry. Gold-bearing veins have been found in the conglomerate and greywacke near the contact with the porphyry, and in the porphyry. Veins have also been found which have been traced from the conglomerate or greywacke into the porphyry.

A well defined zone containing several veins has been recognized. It extends in a northeast-southwest direction through Kirkland lake. The veins, especially those in the conglomerate which are narrow and lenticular, have been subjected to secondary processes. Much of the vein material is of a dark grey colour, differing from the white quartz veins of the Swastika area. The vein filling has been crushed, and fragments of white quartz of the early vein are now enclosed in darker material. The wall rock has also been crushed into the veins, different veins showing conglomerate or porphyry inclusions. Calcite occurs as a later filling in many of the veins.

In addition to a main vein, there may be parallel lenticular structures with impregnations of the intervening country rock by quartz veinlets, giving a ribboned appearance to a cross-section of the deposit. In this case the main vein may carry rich ore with a width of low grade ore on either side of it.

The gold usually occurs finely disseminated in the veins, but occasionally quite coarse gold is found. Iron pyrites and tellurides occur in the ore, but the chemical composition of the tellurides, which are found in small particles, have not been definitely determined. One sample examined qualitatively at the Provincial assay office showed lead, silver and tellurium. Molybdenite occurs in fine fracture planes, along which there has been a concentration of gold. There has been a later movement, and molybdenite and gold have been slickensided. Calcite also occurs in the veins, and gold is sometimes seen in the calcite.

A sample of material from a vein, enclosed in porphyry, from the Wright-Hargrave north of the southeast bay of Kirkland lake, was examined in thin section. There has been much crushing of the quartz and considerable calcite has been deposited in the crushed areas. Along the crushed areas, and in cracks between the quartz grains there is telluride with some gold in grains. Fragments of porphyry occur in the vein, and molybdenite has been deposited in fracture planes. A section of vein material from the No. 2 vein of the Tough-Oakes mine showed a grain of telluride encased in gold.

### Development.

There has been extensive trenching on many veins in the area and shafts have been sunk on several of them.

**Burnside.**—(L. 1823).—A number of veins have been discovered by trenching. A vertical shaft is being sunk on a recently discovered vein in the conglomerate which showed rich ore on the surface.

**Oakes.**—(L. 1557.)—A forty-foot shaft has been sunk on an altered portion of a porphyry dike, somewhat greenish in colour, which is intersected by quartz veinlets. Visible gold can be observed at several places on the surface.

**Robbins.**—(L. 2100.)—Trenching has shown numerous veinlets of quartz intersecting the reddish porphyry, while gold and tellurides occur chiefly in the minute slip planes in the porphyry adjacent to the veinlets.

**Teck-Hughes.**—(L. 1238).—This property is being developed from two vertical shafts, one of which is on a vein in the conglomerate and the other on one in the porphyry.

**Tough-Oakes.**—(H. R. 1441, etc.)—The principal development has been done on No. 2 vein. From an open cut two shipments of high-grade ore were made. A shaft has also been sunk from this open cut to the 200-ft. level. The shaft inclines to the south at 60 degrees, which is the dip of the vein. A station and ore pocket have been cut at the 100-ft. level. Part of the ore from development is being treated in a temporary five-stamp mill by simple amalgamation, while the tailings are being retained for future treatment. The mill treats about 12 tons daily, while about the same tonnage is added to the stock pile of milling ore per day. About 72 tons of high grade ore have been shipped from the mine. One average shipment of 19.98 tons assayed 22.5 oz. gold and 23.4 oz. silver per ton.

**Wright-Hargrave.**—(T.C. 709.—A shaft is being sunk on a quartz vein in the porphyry, in which some high grade gold ore with telluride has been observed on the surface.

Shafts are being sunk on other properties, including the Wettlaufer (L. 16626), Wood (L. 1236) and Hunton (L. 16621).

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## PERSONAL AND GENERAL

Dr. C. M. Carson, a graduate of the University of Toronto, has been appointed head of the department of chemistry at the Michigan College of Mines. He has had experience in teaching at several colleges, and was recently lecturing at Columbia University. Dr. Carson succeeds the late G. A. Koenig, who was for several years in charge of the department.

Mr. Edw. J. Albert, district manager for Cobalt and Porcupine territory for Canadian Allis-Chalmers, Ltd., has been appointed manager of the mining department of the company and transferred to the head office, Toronto.

Dr. H. C. Cooke, of the Geological Survey of Canada, left Vancouver Island, B.C., for Ottawa, about November 7.

Mr. Geo. Watkin Evans, of Seattle, Washington, who spent the field season of last year examining the Groundhog mountain coal basin, in the northern part of Skeena district, British Columbia, has returned to Seattle from the Matanuska coal field in Alaska, where he has this year been superintending coal mining operations for the United States Bureau of Mines which has arranged for a test of coal from that field on a ship of the U. S. navy.

Mr. E. Jacobs, secretary of the Western Branch of the Canadian Mining Institute, attended a joint meeting of the Spokane and Montana local sections of the American Institute of Mining Engineers, held at Wallace, Idaho, on November 15 and 16.

Mr. Robert Keffer, son of Mr. Frederic Keffer, of Greenwood, B.C., has been appointed assistant mining engineer at the Stewart mine, Kellogg, Idaho.

Mr. F. J. Longworth has succeeded Mr. F. R. Weekes as resident engineer at Copper mountain, Similkameen district, for the British Columbia Copper Co., which is developing a large group of copper claims in that camp.

Mr. G. C. McKenzie, of the Mines Branch, Canada Department of Mines, is in charge of the work being done at Nelson, B.C., in connection with the departmental experiments in the metallurgy of complex lead-zinc ores.

Mr. J. P. McFadden, superintendent at the Surprise mine, Slocan, B.C., was on the Pacific coast lately.

Mr. J. W. D. Moodie, vice-president and general manager of the Britannia Mining & Smelting Co., recently returned to Britannia Beach, B.C., from an extended trip in the Eastern States.

Mr. P. L. Naismith, of Calgary, Alberta, superintendent of the Canadian Pacific Railway Co.'s Natural Resources Department, was at Hosmer, Crowsnest Pass, in November.

Mr. E. H. Nutter, of San Francisco, California, chief engineer for the Minerals Separation American Syndicate, was at the Silverton Mines Company's concentration mill, Four-mile creek, Slocan lake district of British Columbia, a few weeks ago, one unit of the syndicate's flotation plant having been put in there.

Mr. Conrad Wolfle, of Spokane, Washington, has again been to a group of copper claims in the northern part of Vancouver island.

# SPECIAL CORRESPONDENCE

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Hollinger.**—Work in the mine continues to show satisfactory progress, 517 feet of drifting having been added to development work during the four weeks ending October 7. Approximately a hundred feet of this has been done upon the 425-ft. level upon No. 1 vein and the values and widths encountered are extremely gratifying showing as they do that there is no falling off in grade or width of ore. Work was started upon the winze which will be carried to 550 feet with as little delay as possible.

**Tough-Oakes.**—It is understood that Mr. C. A. Foster has been successful in floating the Tough-Oakes gold mines of Kirkland Lake, in which he has a controlling interest, in London. The report goes that the three claims which constitute the Tough-Oakes gold mines and two others have been disposed of and that a company will be formed to take them over. Stock is to be offered to the public.

Another high grade shipment has been made from the Tough-Oakes mine. After being sampled at Campbell and Deyell's 30 tons of high grade gold ore has been sold to the United States Metals Company for their smelter at Chrome, New Jersey. It is supposed that the ore will run about the same grade as former shipments, namely, about $400 to the ton.

**McIntyre.**—During October, 3,900 tons were treated in the McIntyre mill, as compared with 2,800 tons during the previous month. With this increased tonnage costs were slightly reduced. The ore ran $9.75 to the ton, 15 cents higher than in September. While the exact cost has not been determined it is expected to be slightly lower than in the previous month when it was $6.60. The extraction was 96.1 per cent., with a total bullion shipment of $38,600. At present 150 tons daily is going through the mill, but this will be increased before the end of the year. The aerial tramway is now in full operation, bringing 60 tons daily to the mill from No. 5 shaft. This working is down to the 300-ft. level where the vein has been developed for 100 ft. Work will be started this month on the new three compartment shaft to be situated midway between the office and the mill. From the 300-ft. level of the mine a raise will be put through to the surface. While this working is under way sinking operations will be commenced. The new work will be connected with No. 1 and 4 shafts on the 300-ft. level, while at 400 ft. connections will be made at No. 5 shaft by means of a lengthy crosscut under the lake. By an evident miscalculation the McIntyre No. 5 vein was cut from the 600-ft. level of the Pearl Lake shaft by the latter company some months ago. Where cut it was 112 feet in on the McIntyre ground and showed a 20-ft. ore body. The deepest point proven by the McIntyre was from the 300-ft. level. A new plant is now being installed at No. 5 shaft consisting of a 12-drill compressor and accessories.

**Dome.**—The October statement of the Dome mine shows that 12,365 tons were milled. The value of gold produced was $118,300, the largest amount produced since May. During the month the mill ran 96 per cent. of the working time, while the value of ore treated is shown as $9.50.

**Schumacher.**—The new shaft at the Schumacher property has been completed and work will start at this point this month. Before the work can be started the compressor plant must be moved to the new point of operations. Recent development on the Dixon property has proven a good ore body within a few feet of the Schumacher line.

The taking up of the option on the St. Paul-Hewitt claims in Bartlett Township by a syndicate of Cobalt and Haileybury men has caused a considerable influx of prospectors into this outlying section of the gold camp. Mr. Robert Bryce, formerly in charge of the Silver Cliff, went south to McArthur with fifteen men to do work on the St. Paul claims. Temporary camps have been erected. In the next few weeks before the option expires in order to ascertain the value of the claims considerable surface work will be done.

The township of Bartlett was first staked two winters ago, but no finds of importance were made. Upon the St. Paul a good showing was uncovered the following summer. The Crown Reserve Mining Company has already had an option on these claims, but allowed it to lapse. As soon as the sleighing is good the road which the Government has cut should be in fair shape.

## COBALT, ELK LAKE, GOWGANDA AND SOUTH LORRAIN

**Cobalt Townsite and City of Cobalt.**—The Northern Customs concentrator sold by the company in which Mr. A. J. Young was a dominant factor for about $250,000, has passed into the possession of the Cobalt Townsite Mining Company. The new owners took charge on November 1st. Of the 120 stamps in the mill 70 are treating Cobalt Townsite ore so that about 175 tons per day are being put through the mill from that mine. This is not yet enough for the mill wants of the Townsite, as is evidenced by the fact that the company is shipping out a large tonnage of low grade ore every week to the smelters. When the new Northern Customs concentrator is ready at mileage 104, the La Rose contract, which required the remainder of the stamps, will be taken there. Until then the La Rose contract must be taken care of and the City of Cobalt cannot yet get access to the mill. When it does it is proposed to treat 50 tons per day. The covered tramway which runs from the top of the shaft house at the City of Cobalt mine to the Northern Customs mill has now been completed. It is expected that the Northern Customs will be able to treat ore between the first and the last of December. The whole of the old mill will then be free for the use of the Cobalt Townsite and allied interests.

**The Chambers-Ferland Mining Company** which is now controlled in England has signed a contract with the Northern Customs concentrator for the use of forty stamps from May 1st next for a period of five years. This will mean the treatment of about 120 tons per day. A writ was issued by Mr. Henry Cecil to block the contract, but it has been signed notwithstanding. The Chambers-Ferland has not been shipping ore since the early months of the year and probably will not until concentrates can be obtained from the mill. It is known that there is a good tonnage of mill rock in the old workings between the La Rose

**View across south end of Cobalt lake**

and O'Brien. There is some good prospective territory in which a shaft is now being sunk to the west of the 64 shaft of the Nipissing.

**The Alladin Cobalt Mining Company,** which took over the old Silver Queen, made its first shipment of the year this week. Thirty-two tons of concentrates were shipped from the old Nipissing Reduction mill which has been leased for a period of two years.

**Casey Cobalt.**—Arising out of a lawsuit in the High Court at Haileybury, some interesting details of the sale of the Bucknell claims to the Casey Cobalt Mining Company appeared. It appeared that Mr. Fred. Connell, the plaintiff in the case, sold the claims through a man named Mitchell to the present English company, who are operating it for $120,000, of which $60,000 was in cash and 12,000 shares of the par value of one dollar. In December, 1906, Mr. Connell received $100 as his commission on the amount paid to date, $100 having been paid down on the deal, and $900 paid within thirty days. In June, 1907, he received $5,000 in full commission of the cash payments as a discount in the selling price he had been granted by the owners. Later that year he received 500 shares of stock of the Casey Cobalt Mining Company.

Last month the Casey Cobalt shipped 30 tons of high grade ore, and already this year has despatched 393.59 tons, all of high grade ore concentrates.

Dr. Willet G. Miller, Provincial Geologist, spent some time last month examining the Casey Cobalt mine and the area in which it is situated.

**Nipissing.**—During the month of October the Nipissing mined ore of an estimated net value of $218,-772 and shipped bullion from the Nipissing and Customs ore of an estimated net value of $348,612. Favourable developments were met with at the fourth level of shaft No. 73. A crosscut was started to encounter possible extensions of several branch veins which showed considerable ore at the third level. This crosscut has encountered what is thought to be the first of those branches. It is 1 to 1½ ins. wide and assays 3,000 ounces. This opening is within a few feet of the Keewatin contact. It is expected that the vein will become more favourable as to widths and values as soon as it is developed further away from the Keewatin.

Preparations for sinking No. 64 shaft from 650 ft. to 900 ft. have almost been completed. A pentice has been put in and sinking has been resumed. At the third level of No. 64 shaft a crosscut is being driven to connect with the third level of vein No. 73. During the month three veins were encountered, one of them assaying several hundred ounces over a width of one inch.

At shaft No. 63 the Little Silver stope at the 245-ft. level continues to produce high grade ore. The stope is about 100 feet long and will average one and a half inches over the entire length. The silver content is 3,000 ounces to the ton.

**The Seneca-Superior** has cut its main vein at the 100-ft. level. From the No. 2 shaft a crosscut run at the 100-ft. cut the main vein at 110 ft. It proved to be 6 ins. wide of 1,000-ounce ore.

At the 200-ft. level there is now a shoot of ore for 400 ft. upon which little stoping has been done. The vein averages from three to four inches of very high grade ore. Below this level a winze was put down for 131 ft. all in the conglomerate. Two levels have now been opened up, one at 262 ft. and one at 335 ft. There is the usual high grade in each working. Already on the upper level 100 ft. of drifting has been done, while on the 335 ft. level the drills are working 80 ft. from the winze.

**Penn-Canadian.**—The production during October from the Penn-Canadian mine amounted to 60,015 ounces. This was a considerable increase over any previous month, the largest previous being 45,050 ounces. The new vein has now been developed for a distance of 35 feet, and it is still good in the face. This is at the 305-ft. level where it is in the conglomerate.

## NOVA SCOTIA

**Loss of the s.s. "Bridgeport."**—The loss at sea of the s.s. "Bridgeport" with forty lives and 10,000 tons of coal, is the worst disaster that has yet occurred in the St. Lawrence coal-freighting trade. No particulars can be given of how this fine steamer and her crew came to their end, but it is known that when she was approaching the vicinity of the Bird Rock Island—an outlier of the Magdalens—a full hurricane was blowing accompanied by blinding snow flurries. A piece of wreckage, probably a portion of a steamer's wheelhouse, was picked up on the Bird Rock Island, and it can only be inferred that the "Bridgeport" was endeavouring to clear the Bird Rock by standing out to sea to the eastward, but driven out of her course by the combined force of a northeast gale and the currents, and blinded by the snow flurries, she struck and sank immediately.

There has been irresponsible talk in the newspapers, as there has been in the case of every similar happening in Nova Scotian waters, that the "Bridgeport" went to sea with insecure hatches, or that she foundered owing to the inability of the vessel to ride out the gale. It is not fair to make such loose assertions, as the "Bridgeport" was classed A1 at Lloyds, and she was specially constructed for the service she was in. The "Bridgeport" and the "Glace Bay" were two sister ships, taking 10 000 tons of coal cargo, and were especially adapted and designed for the St. Lawrence trade. The "Glace Bay" ran ashore and broke up near Trepassey Bay, on the Newfoundland coast, last spring, and it is now only too probable that the "Bridgeport" met the same fate, but, unfortunately, with the loss of her entire crew.

The two steamers were under charter to the Dominion Coal Company, but that company does not suffer any monetary loss beyond the loss of the cargo, and the difficulty of chartering vessels as suitable as these specially constructed steamers. As soon as there was reason for anxiety about the "Bridgeport," the Coal Company despatched their own steamer, "Louisburg," to sea and kept her searching for a week.

The freighting of coal in large quantities between Sydney and Montreal has been reduced to an exact science. All the summer long the colliers load and sail, discharge and return, with the regularity of a railway train service, and it has become difficult to realize that such a happening as the loss of the "Bridgeport" was possible. That last accident of a similar kind was the loss of the "Turret Bay" on St. Paul's Island, about nine years ago. She also was loaded with coal and sank with all her crew. When, however, it is remembered that some two million tons of coal will be freighted from Cape Breton ports to St. Lawrence ports during the summer of 1913, and that similarly large quantities of coal have gone up the river for many years past, the record of the coal-freighting vessels is a good one, and will compare favourably with those of other trades plying in the same waters. Such a record infers careful seamanship and stout vessels, because the shores of northern Cape Breton, the Magdalens, the Gaspe Peninsula and Anticosti are not hospitable coasts, and the Lower Gulf can be very nasty in a northeast gale.

## BRITISH COLUMBIA

As the close of the year approaches some guessing is being done as to what the total value of the mineral production for 1913 will prove to be. In most cases the figures published should be regarded as perhaps not dependable, and where the expectation is given expression to of a higher total than, or even as high as that of last year being reached, it may safely be regarded as nothing more than a guess. To anyone well informed as to the position it is evident that it is unlikely last year's record will be equalled, while to suggest that it will be exceeded indicates a lack of knowledge of some of the conditions that have militated against an increase in 1913 over the value of the production in 1912 which compared so favourably with that of 1910 (labour difficulties having so interfered with mineral production in 1911 as to make a comparison with that year not a fair one). When it is remembered that the total of $32,440,800 in 1912 was $6,063,734, or 23 per cent., greater than that of 1910 (it was $8,941,728 higher than that of 1911), it will be seen that only a continuation of exceptionally favourable conditions would have warranted expectation of a further increase in total value of output, and since that essential has in an important degree been lacking, there does not seem to be sufficient justification for the optimism that has characterized some of the forecasts made. However, it will not be long to the time when, with a fair proportion of the production figures obtainable, an estimate more likely to be near the actual value of production will be practicable, so it does not appear to be wise to go into detail just now to show what the total may be. Meanwhile it will be said here that a somewhat lower total than that of 1912 may be looked for.

Mention was made last month of the receipt of favourable news from the chief placer-gold mining districts, namely, Cariboo and Atlin. Since then newspaper accounts of interviews with several men from the latter district have been printed and these have included statements that seem to be wide of facts. For instance, to suggest that Atlin has this year made an output of more gold than in any other year calls for a prompt response that as the output of that camp in 1912 was $290,000, there is no known reason why it should be believed that in 1913 it has exceeded the $800,000 total of 1899, or even the $530,000 total of a later year. Indeed, there were several other years which reached a total of $400,000 or higher, so, bearing in mind that 1912 is credited with a yield of only $290,000, it seems reasonable to think, under the circumstances that no unusually rich new ground of considerable extent is known to have been worked in 1913, that the district will have done well to have reached even half the total of that of the highest year on record, or say $400,000.

Just one other reference to last month's news notes will now be made. It was then mentioned that there had been a considerable increase in the quantity of ore received at the Consolidated Mining and Smelting Co.'s smeltery at Trail, the figures for the week ended October 30 having been 9,460 tons, and for the immediately preceding week 9,197 tons. No doubt there is a good reason for the decrease—indeed, it has been stated in print that owing to a breakage of the crusher at Trail, shipment of ore from Rossland had to be suspended for two days—but the fact remains that the total for the week ended November 6 was 6,302 tons. At the time of writing figures for the week ended November 13 are not available, but it will be seen that the considerable decrease for the first week in November offsets the increase in the latter half of October. There is this satisfaction, though—it is to be expected that the total of ore receipts for the year will show a gratifying increase.

### EAST KOOTENAY.

**Fort Steele Division.**—News from Moyie is to the effect that recently more silver-lead ore of good grade has been found in the upper workings of the Society Girl mine and that sufficient for a carload has been hauled to the railway for shipment to Trail smelting works. The St. Eugene, which for years was the largest producer of lead in Canada, is now but a small shipper, all its known large bodies of ore having been exhausted. Receipts at Trail of St. Eugene ore in October were 122 tons, and for the week ended November 6, 110 tons. The only other metalliferous mine in this division of East Kootenay is the Sullivan, which as well as the St. Eugene is operated by the Consolidated Mining and Smelting Co. During October, more than 3,000 tons of Sullivan lead ore was received at Trail, and for the week ended November 6, 950 tons.

## WEST KOOTENAY.

**Ainsworth Mining Division.**—The work of sinking the main shaft of the Silver Hoard to the 200-ft. level will be completed during November. Good progress is being made with other underground development. It is estimated that there is approximately 3,000 tons of ore of shipping grade blocked out on the 100-ft. level. During two recent months the quantity of ore shipped to Trail has averaged 55 tons a week; preparations are being made to increase the output, by the first of the coming year, to about 20 tons a day. An electrically operated hoist will be installed by the end of December, and it is planned to shortly put in a two-drill combination Temple-Ingersoll compressor. A new cookhouse, with accommodation for 50 men, is being erected and the camp generally put in good condition for the winter. Some 30 men are employed at the mine, and the intention is to add to the number as soon as this can be done with advantage.

**Slocan.**—Late reports from the Rambler-Cariboo state that mine and concentrating mill are in better condition for production than for some time past, and that it is expected an output of ore up to capacity will be maintained from now on. A stope recently opened from the 1,200-ft level is in an ore shoot including from 9 in. up to 3 ft. of clean shipping ore. In addition, there is blocked out in different parts of the mine sufficient ore of milling grade to keep the mill fully supplied for many months. A new cable for the aerial tramway from mine to mill is being placed; this will shortly be available for use and it will increase the carrying capacity of the tramway to 17 tons an hour, or nearly twice as much as under former conditions. A pebble mill is being put in at the concentrator, to facilitate saving the zinc associated with silver and lead in the ore. Twelve cars of zinc concentrate, consigned to Bartlesville, Oklahoma, were shipped lately, and shipment of zinc as well as silver-lead ore is to be continued regularly. The mill is running satisfactorily, and there is general improvement in the mine. The number of men on the company's payroll, including those at both mine and mill, is 65.

A reorganization of the Lucky Jim Zinc Mines, Ltd., which has for several years been operating the Lucky Jim mine, in Slocan district, is proposed. The president told a meeting of shareholders held in Winnipeg, Manitoba, on October 28, that all the known high-grade zinc ore had been exhausted, so nothing remains but to exploit the bodies of low grade lead-zinc ore. A second mortgage of the property had been given. The liabilities of the company total $81,000. Foreclosure proceedings have been commenced by the first mortgagee. In addition to present liabilities, $25,000 is needed to provide for new work proposed. A meeting of shareholders is to be held in Victoria, B.C., during November, and proxies were asked for by the directors to support the proposed reorganization, and an assessment of five cents a share, the proceeds to be used for paying off existing liabilities and providing funds for further development of the mine.

Wm. Thomlinson, who for the last six months has been engaged in collecting for the Provincial Department of Mines samples of ores from numerous mining properties in Slocan and Ainsworth mining divisions, has contributed for publication the following comment: "An effective method of treating economically the zinc-silver ores of Kootenay is very desirable and would be of much commercial importance. In the district lying between the north half of Kootenay lake and Slocan lake there are more than 20 developed mining properties which contain, either entirely or in addition to other ores, large quantities of zinc-silver ore containing from 20 to 55 per cent. zinc and 15 to 250 ozs. silver a ton. Thousands of tons of such ore is on the dumps or in the stopes of Kootenay mines awaiting shipments to metallurgical works where penalties on zinc content of the ore and heavy losses in silver could be avoided."

The report of the Van Roi Mining Co., Ltd., for September from its Van-Roi mine, in Silverton camp, has been received from the company's head office in London. Development work was done, with a small force of men employed, to a total of 98 ft., in drifts on level 9 and in raises from that level. The best showing of ore was in a raise in the main vein where for 33 ft. the ore averaged 16.6 oz. of silver a ton, 3.4 per cent. lead, and 8.7 per cent. zinc across an average width of 60 in. in the western half. The mill was run for 96 hours on accumulations of material produced by recent developments. The total quantity crushed was 587 tons, which yielded 10 tons of lead concentrate assaying 100.2 oz. silver a ton, 53.2 per cent. lead, and 11.7 per cent. zinc, and 20 tons of zinc concentrate assaying 27.2 oz. silver a ton, 3.1 per cent. lead, and 37.8 per cent. zinc.

## ROSSLAND.

The report of the Le Roi No. 2, Ltd., for September from its Josie mine, in this camp, has been received from the company's head office in London. Ore shipments to Trail totalled 1,729 tons, this including 85 tons of concentrate. Receipts from the smeltery were $33,404. Estimated costs for corresponding period were: For development, $8,000; ore production, $7,000; milling, $1,100; total, $16,100. Development work done totalled 230 ft.; this was on the 600, 700, and 900-ft. levels and the shaft tunnel in what is known as the Josie drift. Of 56 ft. advanced in this last-mentioned working, for 40 ft. the average value of the ore across an average width of 13 in. was: Gold 12 dwt. a ton, and copper 5 per cent. On the 600-ft. level, in the Hamilton vein west, 20 ft. advanced was in ore of an average width of 25 in. and containing gold 9 dwt. a ton, and copper 0.9 per cent.

## HEDLEY.

After nearly four months' diamond-drilling on a group of mineral claims on Twenty-Mile creek, Camp Hedley, Similkameen, the New York Syndicate No. 2 has suspended work for the ensuing winter. These claims were bonded last winter by Mr. T. Walter Beam, of Denver, Colorado, for New York principals, among them men largely interested in the Hedley Gold Mining Co. Deep snow and the steepness of the side of the Twenty-Mile canyon made the arrangement of preliminaries slow work, so that it was not until early summer it was practicable to commence drilling. Two pipe lines, one for water and the other for compressed air, were laid a distance of rather more than a mile, from the Nickel Plate mine over the mountain to the canyon, and camp was made as well. With three shifts of men employed and full time worked until cold weather set in and necessitated a stoppage, three holes were drilled, two of them deep ones, but no large orebody was found. The cost of this undertaking was approximately $40,000. Conditionally that suitable arrangements shall be made regarding time of payments on purchase price of claims, it is stated that the syndicate will do more drilling next summer. Mr. Beam was engineer in charge and Mr. G. P. Jones, of the Hedley Gold mining Co., superintended operations during the past season.

## OBSERVATORY INLET.

The Granby Consolidated Co., which is developing a large copper mine and erecting a smelter at Anyox, Observatory inlet, British Columbia, is evidently determined to treat its men well, and is erecting cottages for them. The rental is $3 per month per room, with electric light, bath in every house, even with two rooms. At the mine there are fourteen 4-room and four 5-room cottages completed. The old bunkhouse has been renovated and will house 35 men. A two-storey bunkhouse, 30 by 120 ft., with basement containing lockers, showers, and tubs, is ready for 110 men. The mess has a capacity of 250 men, with cold-storage plant. All buildings are connected with water and sewer systems sufficient for present and future needs.

## PORTLAND CANAL.

Supplies sufficient to last until next spring have been sent to the camp of the Indian Mines, Ltd., situated in the vicinity of Cascade creek, a tributary of Salmon river, and distant from the head of Portland canal about 14 miles. No. 1 adit is now in about 350 ft.; this is being driven to open the ground under an ore deposit 19 ft. wide where a prospect shaft has been sunk in it from the surface at about 160 ft. above the adit. At 100 ft. in the adit exposed what is thought to be the top of a blind lead; at 300 ft. in a shoot of ore 5 ft. in width was encountered, this being at a depth of 125 ft. from the surfaee. No. 2 adit is a drift at a vertical depth of 160 ft. below No. 1; it is now in about 60 ft. and has been in ore all the way running about 3 ft. in width. On the whole, the ore opened is concentrating, though there is a fair proportion that could be sorted out for shipment to the smelting works as crude ore. Assays of samples from the blind lead above mentioned gave returns up to $17 a ton, chiefly in gold; others, from the orebody at 200 ft. in from the portal of No. 1 adit returned on an average about $12 in gold and 4 oz. silver a ton. That from the surface opening gave 40 per cent. lead, 20 ozs. silver a ton, and a little gold.

## GENERAL NEWS.

The Granby Consolidated Co.'s production figures for ten months to the end of October, 1913, are as follows: Granby ore smelted, 1,023,766 tons; custom ore, 12,614 tons; total ore treated, 1,036,380 tons. Blister copper produced, 18,115,987 lbs.

The report that an application had been made to the Minister of Labour for the appointment of a board of investigation and conciliation in connection with the strike of coal-mine employees on Vancouver island has been contradicted. No progress had been made by the middle of November toward a settlement of the trouble. There is little doubt that the main point at issue now is the recognition of the United Mine Workers of America, which is a serious difficulty and one not likely to be overcome since the coal-mining companies affected have hitherto shown no signs of making such a concession.

## LA ROSE IN OCTOBER.

The October production of the La Rose Consolidated Mines Company was as follows:

| | |
|---|---|
| Production of silver, 203,454 ozs., of value.. | $120,329 |
| Plus sundry income | 3,724 |
| | $124,053 |
| Less— | |
| Marketing, concentration and operating expenses | 56,126 |
| Profits for October, 1913 | $67,927 |

The cash surplus as of October 31st amounts to $1,709,579, made up as follows:

| | |
|---|---|
| Cash surplus | $1,445,713 |
| Outstanding shipments and ore on hand at mine ready for shipment | 292,407 |
| | $1,738,120 |
| Less current liabilities | 28,541 |
| | $1,709,579 |

## COBALT ORE SHIPMENTS.

The ore shipments from the Cobalt camp for the week ending November 22 were:

| Mine. | High grade. | Low grade | Total lbs. |
|---|---|---|---|
| Townsite | 158,700 | 168,000 | 326,700 |
| McKinley-Darragh | 63,410 | ...... | 63,410 |
| La Rose | 87,200 | 160,000 | 247,200 |
| Dom. Reduction | 64,500 | ...... | 64,500 |
| Cobalt Comet | 75,138 | ...... | 75,138 |
| Right of Way | 80,520 | ...... | 80,520 |
| Seneca Superior | 79,334 | ...... | 79,334 |
| Cobalt Lake | 103,570 | ...... | 103,570 |
| Penn-Can. | 81,450 | 56,110 | 157,560 |
| | 713,832 | 384,110 | 1,097,942 |

The bullion shipments for the week ending November 22 were:

| | Ounces. | Value. |
|---|---|---|
| Nipissing | 180,879.61 | $108,075.56 |
| Dom. Reduction | 12,441.00 | 7,371.29 |
| | 193,320.61 | $115,426.85 |

## McINTYRE.

Official returns from the McIntyre Porcupine mines for the month of October showed that while ore ran $9.57 a ton, costs amounted to $6,133. Total production amounted to $41,098.64.

Detailed figures are.

| | |
|---|---|
| Ore milled, 4,131 tons at $9.57 | $39,551.80 |
| Concentrates milled, 26 tons at $59.494 | 1,546.84 |
| Total ore milled—4,157 tons. | |
| | $41,098.64 |
| Production—Bullion shipped— | |
| Bar No. 24 | $13,502.52 |
| Bar No. 25 | 10,171.25 |
| No. 26 | 13,393.99 |
| Bullion on hand, and slag | 2,174.90 |
| | $39,242.66 |
| Extraction | 95.5 p.c. |

Running time—720 hours or 96.77 p.c. of the possible running time. Expenditures for permanent additions to buildings:

| | |
|---|---|
| Plant and equipment | $7,079.67 |
| Operating costs per ton milled— | |
| General charges | $ .964 |
| Mining | 1.806 |
| Mine development | 1.938 |
| Milling | 1.425 |
| Total | $7.133 |

# MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.) November 24, 1913.

### New York Curb.

| | Bid. | Ask. |
|---|---|---|
| Alaska Gold | 18.50 | 19.50 |
| British Copper | 2.25 | 2.30 |
| Braden Copper | 6.62 | 6.87 |
| California Oil | 198.00 | 205.00 |
| Chino Copper | 37.37 | 38.00 |
| Giroux Copper | .75 | 1.25 |
| Green Can. | 6.00 | 7.00 |
| Miami Copper | 21.00 | 21.50 |
| Nevada Copper | 14.75 | 15.00 |
| Ohio Oil | 132.00 | 134.00 |
| Ray Cons. Copper | 17.12 | 17.50 |
| Standard Oil of N. Y. | 157.00 | 159.00 |
| Standard Oil of N. J. | 375.00 | 377.00 |
| Standard Oil (old) | 118.00 | ... |
| Tonopah Mining | 5.00 | 5.25 |
| Tonopah Belmont | 7.25 | 7.50 |
| Tonopah Merger | .55 | .58 |
| Inspiration Copper | 14.00 | 14.50 |
| Goldfield Cons. | 1.43 | 1.50 |
| Yukon Gold | 2.00 | 2.12 |

### Porcupine Stocks.

| | Bid. | Ask. |
|---|---|---|
| Apex | .00½ | .01 |
| Dome Extension | .06 | .06½ |
| Dome Lake | .18 | .18½ |
| Dome Mines | 12.75 | 13.25 |
| Eldorado | .00½ | .01 |
| Foley-O'Brien | .18 | .18½ |
| Hollinger | 17.00 | 17.10 |
| Jupiter | .06 | .06½ |
| McIntyre | 1.90 | 2.00 |
| Moneta | .02 | .04 |
| North Dome | ... | .40 |
| Northern Exploration | .75 | 1.25 |
| Pearl Lake | .10 | .10½ |
| Plenaurum | .. | .70 |
| Porcupine Gold | .11½ | .11¾ |
| Imperial | .01 | .02 |
| Porcupine Reserve | ... | .06 |
| Preston East Dome | .01¼ | .01¾ |
| Rea | .12 | .16 |
| Standard | .. | .01 |
| Swastika | .02¾ | .03 |
| United | ... | .01 |
| West Dome | .05 | .10 |
| Porcupine Crown | 1.24 | 1.25 |
| Teck Hughes | .20 | .30 |

### Cobalt Stocks.

| | Bid. | Ask. |
|---|---|---|
| Bailey | .05¾ | .06 |
| Beaver | .33½ | .34 |
| Buffalo | 1.75 | 2.00 |
| Canadian | .14 | .16 |
| Chambers-Ferland | .15½ | .16 |
| City of Cobalt | .30 | .35 |
| Cobalt Lake | .55 | .60 |
| Coniagas | 6.75 | 7.20 |
| Crown Reserve | 1.67 | 1.70 |
| Foster | .07 | .08 |
| Gifford | .01¾ | .02 |
| Gould | .03 | .03¼ |
| Great Northern | .10¾ | .11 |
| Hargraves | .03 | .04 |
| Hudson Bay | 65.00 | 67.00 |
| Kerr Lake | 4.55 | 4.60 |
| La Rose | 1.87 | 1.91 |
| McKinley | 1.20 | 1.21 |
| Nipissing | 7.90 | 8.00 |
| Peterson Lake | .25½ | .26 |
| Right of Way | .04 | .05 |
| Rochester | .03 | .04 |
| Leaf | .01¾ | .02 |
| Cochrane | ... | .40 |
| Silver Queen | .03 | .05 |
| Timiskaming | .14 | .14½ |
| Trethewey | .29 | .32 |
| Wettlaufer | .07 | .09 |
| Seneca Superior | 2.50 | 2.75 |

## TORONTO MARKETS.

Nov. 24.—(Quotations from Canada Metal Co., Toronto):

Spelter, 5 cents per pound.
Lead, 5½ cents per pound.
Tin, 42 cents per pound.
Antimony, 8½ cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 10 to 15 cents per pound.

Nov. 24.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto):

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).

Nov. 24.—(Quotations from Elias Rogers Co., Toronto):

Coal, anthracite, $8.00 per ton.
Coal, bituminous, lump, $5.25 per ton.

## GENERAL MARKETS.

Nov. 21.—Connellsville coke (f.o.b. ovens):

Furnace coke, prompt, $1.85 to $1.90 per ton.
Foundry coke, prompt, $2.50 to $2.75 per ton.

Nov. 21.—Tin, straits, 39.80 cents.

Copper, Prime Lake, 15.00 to 15.50 cents.
Electrolytic Copper, 14.75 to 15.00 cents.
Copper wire, 16.00 to 16.25 cents.
Lead, 4.35 cents.
Spelter, 5.30 to 5.35 cents.
Sheet zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 7.40 to 7.50 cents.
Aluminum, 19.00 to 19.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, $43.00 to $44.00 per ounce.
Platinum, hard, 10 per cent., $46.00 to 47.50 per ounce.
Platinum, hard, 20 per cent., $49.00 to $51.50 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $38.00 per 75-lb. flask.

## SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| Nov. 11 | 59⅞ | 27$\frac{15}{16}$ |
| " 12 | 59¾ | 27⅝ |
| " 13 | 59½ | 27½ |
| " 14 | 59½ | 27½ |
| " 15 | 59⅜ | 27$\frac{7}{16}$ |
| " 17 | 59 | 27¼ |
| " 18 | 59¼ | 27⅜ |
| " 19 | 59 | 27¼ |
| " 20 | 58⅜ | 27 |
| " 21 | 58¼ | 26$\frac{15}{16}$ |
| " 22 | 57⅞ | 26¾ |
| " 24 | 58⅛ | 26⅞ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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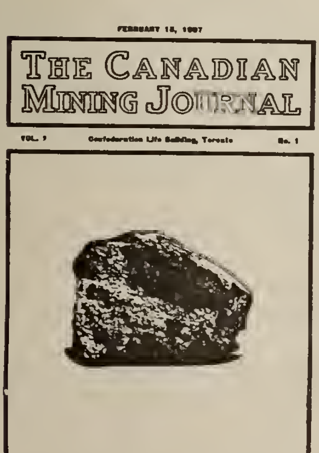


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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1165. Memoir No. 18. Bathurst District, New Brunswick, by G. A. Young. Maps not yet published.

QUEBEC

1186. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec, by John A. Dresser.

ONTARIO

1160. Memoir No. 17. Larder Lake District, Ont., and Adjoining Portions of Pontiac County, Quebec, by Morley E. Wilson.
1242. Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.
1220. Memoir 29. Oil and gas prospects of the Northwest Provinces of Canada, by Wyatt Malc m. Map not yet published.

BRITISH COLUMBIA

1175. Memoir No. 21. The Geology and Ore Deposits of Phoenix, Boundary District, B.C., by O. E. LeRoy.

YUKON AND NORTH WEST TERRITORIES

1228. Memoir No. 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

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1042. Mineral Map of Canada. Scale 100 miles to 1 inch.
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1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmoreland Counties, N.B. Geology and topography. Scale 1 mile 1 inch.

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1178. Map 32A. Larder Lake and Opasatika Lake, Nipissing, Abitibi and Pontiac, Ontario and Quebec. Geological. Scale 2 miles to 1 inch.

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750. Grenville Sheet. Parts of Counties of Ottawa, Argenteuil, Terrebonne, Two Mountains and Vaudreuil, Quebec and Carleton, Russell, Prescott and Glengarry, Ontario. Geology. Scale 4 miles to 1 inch. Reprint.
1177 Map 31A. Larder Lake, Nipissing District, Ontario. Geology. Scale 1 mile to 1 inch.
1244. Map 64A. Advance geological copy of map of Gowganda Mining Division and vicinity. Scale 1 mile to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

1260-1276. Maps 74A-90A. Geology of the Forty-ninth Parallel. Geology and topography of the International Boundary between British Columbia and the United States. Scale 1 mile to 1 inch, contour interval 100 feet.
1237. Map 62A. Nelson and vicinity, British Columbia. Geology and topography. Scale 1 mile to 1 inch. feet

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

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# BUYERS AND SELLERS OF METALS

## ALPHABETICAL INDEX TO ADVERTISERS

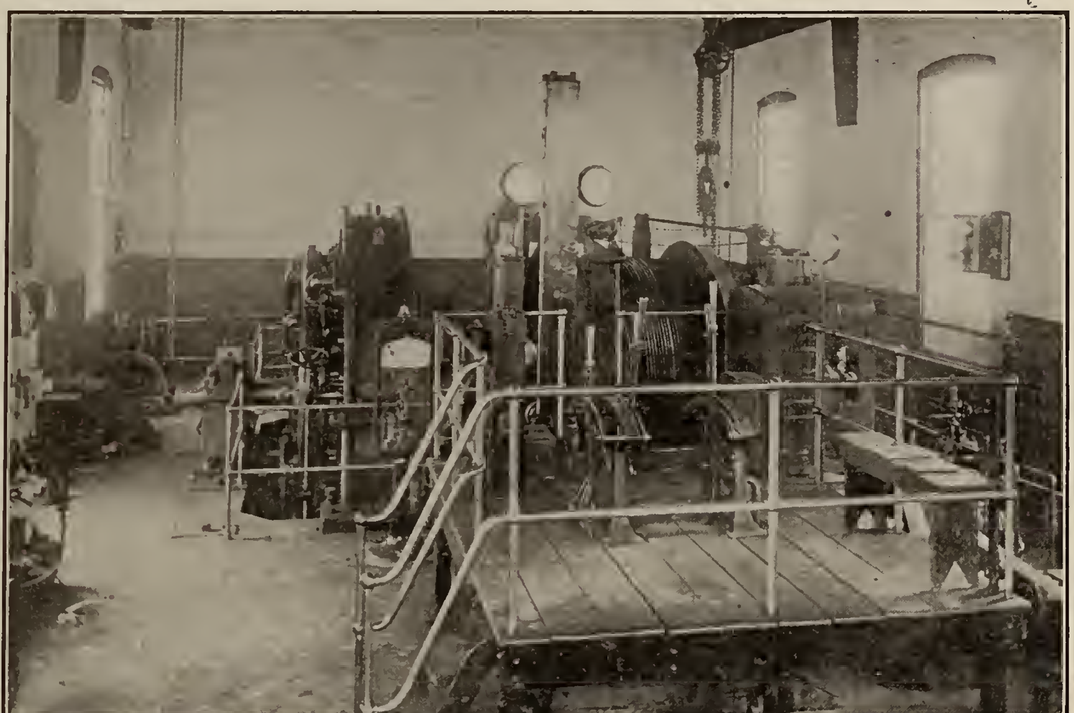
SIEMENS BROS. DYNAMO WORKS | SIEMENS BROS. & CO.

S I E M E N S

# SIEMENS

S I E M E N S

SIEMENS—SCHUCKERTWERKE | SIEMENS & HALSKE



## Siemens Electric Hoisting Engine supplied and installed by us for the Dominion Coal Co., Cape Breton

**Output 185 short tons per hour from a 5000 foot slope, peak load 1320 H.P.**

**We have supplied or on order for Canada the following Electric Hoisting Engines:**

| | | |
|---|---|---|
| 1—1900 H.P. | Peak Load, | Dominion Coal Company. |
| 1—1900 H.P. | " " | Dominion Coal Company. |
| 1—1560 H.P. | " " | Canadian Collieries, British Columbia. |
| 1—1320 H.P. | " " | Dominion Coal Co., (in operation). |
| 1— 750 H.P. | " " | Canadian Collieries, British Columbia. |
| 1— 400 H.P. | " " | Dominion Coal Co., (in operation). |
| 1— 450 H.P. | " " | Acadia Coal Co., (in operation). |
| 1— 450 H.P. | " " | Acadia Coal Co., (in operation). |

The Siemens Companies undertake the complete electrical equipment of mines, collieries, factories, steel works, rolling mills, pulp and paper mills, and electrical plants of every description. Over 200 electrically driven hoisting engines have been installed with peak loads from 500 H.P. to 5000 H.P.

Further information will be gladly furnished on request, and schemes prepared showing the economy of electric drive over steam winding.

# Siemens Company of Canada, Limited

HEAD OFFICE
TRANSPORTATION BUILDING - MONTREAL

BRANCH OFFICES:

STANDARD BANK BUILDING
TORONTO

McARTHUR BUILDING
WINNIPEG

# The Canadian Miner's Buying Directory.

**Amalgamations—**
- Canadian Allis-Chalmers, Ltd
- Fraser & Chalmers, Ltd.
- Krupp, Fried, A. G., Germany
- Northern Canada Supply Co.

**Assayers and Chemists—**
- Milton L. Hersey Co., Ltd.
- Campbell & Deyell, Cobalt, Ont.
- Ledoux & Co., 99 John St., New York.
- Thos. Hayes & Son, 124 onge St., Toronto.

**Assayers' and Chemists' Supplies—**
- C. L. Berger & Sons, 37 William St., Boston, Mass.
- Lymans, Ltd., Montreal, Que.
- Stanley, W. F. & Co., Ltd.
- John Davis & Sons.
- Peacock Bros.
- Consolidated Optical Co.

**Ball Mills—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Peacock Brothers.
- Mussens, Limited.
- Krupp, Fried. A. G., Germany
- The John Inglis Co., Ltd.

**Beams—Steel—**
- Canadian Allis-Chalmers, Ltd
- Dominion Bridge Co.
- Krupp, Fried.A. G., Germany.
- Mussens, Limited.

**Belting—**
- Canadian Allis-Chalmers, Ltd
- Mussens, Limited.
- Northern Canada Supply Co.
- Jones & Glassco.
- Canadian Fairbanks-Morse Co., Ltd.
- Federal Engineers Co., Ltd.

**Blasting Batteries and Supplies—**
- Canadian Allis-Chalmers, Ltd.
- Thomas & William Smith.
- Can. Ingersoll-Rand Co., Ltd.
- Curtis & Harvey (Canada), Limited.
- Mussens, Limited.
- Northern Canada Supply Co.

**Blowers—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried.A. G., Germany.
- Mussens, Limited.
- Northern Canada Supply Co.

**Boilers—**
- Canadian Allis-Chalmers, Ltd.
- E. Leonard & Sons.
- Fraser & Chalmers, Ltd.
- International Engineering Works, Ltd.
- Waterous Engine Works Co., Ltd.
- Canadian Fairbanks-Morse Co., Ltd.
- Mussens, Limited.
- Peacock Brothers.
- Northern Canada Supply Co.
- Canadian Ingersoll-Rand Co., Ltd.
- The John Inglis Co., Ltd.

**Buckets—**
- Canadian Allis-Chalmers, Ltd.
- Peacock Brothers.
- M. Beatty & Sons, Ltd.
- Waterous Engine Works.
- Mussens, Limited.
- Jenckes Machine Co.
- Northern Canada Supply Co.

**Buildings—Steel Frame—**
- Dominion Bridge Co.
- Canadian Allis-Chalmers, Ltd.

**Cable — Aerial and Underground—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Northern Canada Supply Co.

**Cableways—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- M. Beatty & Sons, Limited.
- Mussens, Limited.
- Jenckes Machine Co.

**Cages—**
- Fraser & Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Jenckes Machine Co.
- Mussens, Limited.
- Northern Canada Supply Co.

**Cables—Wire—**
- Standard Underground Cable Co. of Canada, Ltd.

**Cars—**
- Jeffrey Mfg. Co.
- Mussens, Ltd.
- Northern Canada Supply Co.
- Jenckes Bros.
- Orenstein Arthur Koppel Co

**Cement Machinery—**
- Canadian Allis-Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Northern Canada Supply Co.
- Peacock Brothers.

**Chains—**
- Jeffrey Mfg. Co.
- Peacock Brothers.
- Jones & Glassco.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co.
- B. Greening Wire Co., Ltd.
- Northern Canada Supply Co.

**Chemists—**
- Canadian Laboratories.
- Campbell & Deyell.
- Thos. Heys & Son.
- Milton Hersey Co.
- Ledoux & Co.

**Coal—**
- Dominion Coal Co.
- Nova Scotia Steel & Coal Co.

**Coal Cutters—**
- Canadian Allis-Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Sullivan Machinery Co.
- Can. Ingersoll-Rand Co., Ltd.
- Peacock Bros.
- Mussens, Limited.

**Coal Mining Explosives—**
- Curtis & Harvey (Can.), Ltd

**Coal Mining Machinery—**
- Can. Ingersoll-Rand Co., Ltd.
- Fraser & Chalmers, Ltd.
- Peacock Brothers.
- Jeffrey Mfg. Co.
- Head, Wrightson & Co., Ltd.

**Coal Punchers—**
- Sulivan Machinery Co.
- Canadian Ingersoll-Rand Co., Ltd.

**Coal Washeries—**
- Jeffrey Mfg. Co.
- Mussens, Limited.
- Peacock Brothers.
- Head, Wrightson & Co., Ltd.

**Compressors—Air—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Sullivan Machinery Co.
- Canadian Allis-Chalmers, Ltd.
- Laurie & Lamb.
- Canadian Westinghouse.
- Can. Ingersoll-Rand Co., Ltd.
- Cleveland Pneumatic Tool Co. of Canada, Ltd.
- Mussens, Limited.
- Peacock Brothers.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Concentrators and Jigs.**
- Canadian Allis-Chalmers, Ltd.
- Diester Machine Co.
- Fraser & Chalmers, Ltd.
- Jenckes Machine Co.
- James Ore Concentrator Co.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
- Canadian Allis-Chalmers, Ltd.
- Peacocks Brothers.
- Mussens, Limited.
- Northern Canada Supply Co.

**Condensers—**
- Canadian Allis-Chalmers, Ltd.
- E. Leonard & Sons.
- Fraser & Chalmers, Ltd.
- Smart-Turner Machine Co., Ltd.
- Peacock Brothers.
- Laurie & Lamb.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Converters—**
- Canadian Westinghouse.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.

**Conveyors—Belt—**
- Head, Wrightson & Co., Ltd.
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Jenckes Machine Co.
- Northern Canada Supply Co.
- Peacock Brothers.
- Krupp, Fried. A. G., Germany.
- Mussens, Limited.
- Waterous Engine Works.
- Canadian Fairbanks-Morse. Co., Ltd.

**Cranes—**
- SmartTurner Machine Co.
- Peacock Brothers.
- Mussens, Limited.
- Canadian Fairbanks-Morse Co., Ltd.
- M. Beatty & Sons, Ltd.
- Krupp, Fried. A. G., Germany.

**Crane Ropes—**
- Allan, Whyte & Co.
- Thos. & Wm. Smith.
- B. Greening Wire Co., Ltd.

**Crushers—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Jenckes Machine Co.
- Peacock Brothers.
- Lymans, Limited.
- Can. Fairbanks-Morse Co.
- Mussens, Limited.
- Hadfields Steel Foundry Co.

**Cyanide Plants—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Roessler & Hasslacher.
- Mussens, Limited.
- Thomas & William Smith.
- Peacock Brothers.

**Derricks—**
- Smart-Turner Machine Co.
- S. Flory Mfg. Co.
- M. Beatty & Sons, Ltd.
- Mussens, Limited.

**Diamond Drill Contractors—**
- Diamond Drill Contracting Co.
- Smith & Travers.

**Dredging Machinery—**
- Canadian Allis-Chalmers, Ltd.
- Peacock Brothers.
- M. Beatty & Sons.
- Mussens, Limited.

**Dredging Ropes—**
- Allan, Whyte & Co.
- Fraser & Chalmers, Ltd.
- B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**
- Canadian Allis-Chalmers, Ltd.
- Can. Ingersoll-Rand Co., Ltd.
- Mussens, Limited.
- Jeffrey Mfg. Co.
- Sullivan Machinery Co.
- Peacock Brothers.
- Northern Canada Supply Co.

**Drills—Core—**
- Can. Ingersoll-Rand Co., Ltd.
- Canadian Allis-Chalmers, Ltd.
- Standard Diamond Drill Co.

**Drills—Diamond.**
- American Diamond Rock Drills.
- Sullvan Machinery Co.
- Northern Canada Supply Co.

**Drill Steel Sharpeners—**
- Canadian Ingersoll-Rand Co.
- Northern Canada Supply Co.

**Drills—Electric—**
- Canadian Allis-Chalmers, Ltd.
- Mussens, Limited.
- Siemens Co. of Can., Ltd.
- Canadian Ingersoll-Rand Co.

**Dump Cars—**
- Sullivan Machinery Co.
- Waterous Engine Works Co.
- Mussens, Limited.
- Orenstein-Arthur Koppel Co.

**Dynamite—**
- Curtis & Harvey (Canada). Limited.
- Canadian Explosives.
- Northern Canada Supply Co.

**Dynamos—**
- Can. Westinghouse Co.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Canada, Ltd.

**Ejectors—**
- Mussens, Limited.
- Peacock Brothers.
- Canadian Ingersoll-Rand Co., Ltd.
- Northern Canada Supply Co.

**Elevators—**
- Canadian Allis-Chalmers, Ltd.
- Jeffrey Mfg. Co.
- Krupp, Fried. A. G., Germany.
- M. Beatty & Sons.
- Sullivan Machinery Co.
- Northern Canada Supply Co.
- Waterous Engine Works.
- Jenckes Machine Co.
- Can. Fairbanks-Morse Co.
- Mussens, Limited.
- Peacock Brothers.

**Engineering Instruments—**
- C. L. Berger & Sons.
- Peacock Brothers.

**Engineers and Contractors—**
- Fraser & Chalmers, Ltd.
- Krupp, Fried. A. G., Germany.
- Roberts & Schaefer Co.

**Engines—Automatic—**
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- Waterous Engine Works Co.
- The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Mussens, Limited.
- E. Leonard & Sons.
- Alex. Fleck.
- Sullivan Machinery Co.
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- M. Beatty & Sons.
- Canadian Westinghouse.
- John Inglis & Co., Ltd.
- Can. Fairbanks-Morse Co.

**Engine—Haulage—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Peacock Brothers.
- E. Leonard & Sons.
- Jenckes Machine Co.

**Engines—Marine—**
- Smart-Turner Machine Co.
- Jenckes Machine Co.
- Peacock Brothers.
- The John Englis Co., Ltd.
- Can. Fairbanks-Morse Co.

**Engines—Oil—**
- Jenckes Machine Co.
- Peacock Brothers.
- Can. Fairbanks-Morse Co.

**Engines—Steam—**
- Canadian Allis-Chalmers, Ltd.
- E. Leonard & Sons.
- Fraser & Chalmers, Ltd.
- Smart-Turner Mahine Co.
- Robb Engineering Co.
- S. Flory Mfg. Co.
- Jenckes Machine Co.
- Alex. Fleck.
- Peacock Bros.
- M. Beatty & Sons.
- Laurie & Lamb.
- Mussens, Limited.
- Can. Fairbanks-Morse Co.
- The John Inglis Co., Ltd.

**Fans—Ventilating—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Sullivan Machinery Co.
- Peacock Brothers.
- Mussens, Limited.

**Feeders—Ore—**
- Canadian Allis-Chalmers, Ltd.
- Fraser & Chalmers, Ltd.
- Krupp, Fried, A. G., Germany.
- Mussens, Limited.

**Filters—**
- Krupp, Fried, A. G., Germany.

**Forges—**
- Mussens, Limited.
- **Can. Fairbanks-Morse Co.**
- Northern Canada Supply Co. Ltd.

**Forgings—**
- M. Beatty & Sons.
- Canadian Cleveland Drill Co.
- Smart-Turner Machine Co.
- Peacock Brothers.

**Furnaces—Assay—**
- Krupp, Fried, A. G., Germany.
- Lymans, Limited.
- Mussens, Limited.

**Fuse—**
- Peacock Brothers.
- Curtis & Harvey, (Canada). Limited.
- Canadian Westinghouse.
- Canadian Explosives.
- Mussens, Limited.
- Northern Canada Supply Co.

**Gears—**
- Canadian Westinghouse.
- Krupp, Fried, A. G., Germany.
- Smart-Turner Machine Co.
- Northern Canada Supply Co.
- The John Inglis Co., Ltd.

**Generators—**
- Canadian Westinghouse.
- Peacock Brothers.
- Can. Fairbanks-Morse Co.
- Siemens Co. of Canada., Ltd.

**Girders—Steel—**
- Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghiouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co. Ltd
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty & Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
Consolidated Mining & Smelting Co.
Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
E. Leonard & Sons.
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Northern Canada Supply Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Canadian Allis-Chalmers, Ltd.
Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rrand Co.

**Pumps—Sinking—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
E. Leonard & Sons.
Can. Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
Can. Fairbanks-Morse Co.
E. Leonard & Sons.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A.G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Rolling Mill Machinery—**
Krupp, Fried. A.G., Germany.

**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd

**Roofing—**
Patterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A.G., Germany.
Thos. Hays & Sons.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Can. Allis-Chalmers, Ltd.
Peacock Bros.
Waterous Engine Co.
Fraser & Chalmers, Ltd.

**Separators—**
E. Leonard & Sons.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.

**Shavels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Diester Concentrator Co.
James Ore Concentrator.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Smelting Machinery—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Allis-Chalmers.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Bros.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co. Ltd.
Peacock Brothers.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
John Davis & Son.
Consolidated Optical Co. Ltd

**Switchboards—**
Canadian Westinghouse.
Can. Allis-Chalmers. Ltd.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
E. Leonard & Sons.
Peacock Bros.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Can. Allis-Chalmers Ltd
Jenckes Machine Co.

**Transformers—**
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Sons.
Peacock Brothers.

**Tractors—Oil—**
Canadian Fairbanks-Morse Co., Ltd.

**Tube Mills—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Turbines—**
Canadian Westinghouse.
Peacock Brothers.
Laurie & Lamb.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
Krupp, Fried. A. G., Germany,
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# CANADIAN MINING JOURNAL

VOL. XXXIV TORONTO No. 24



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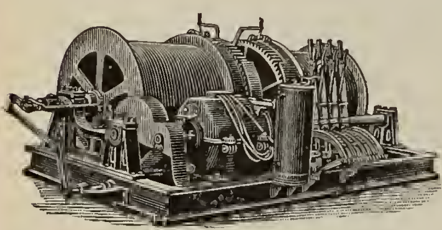

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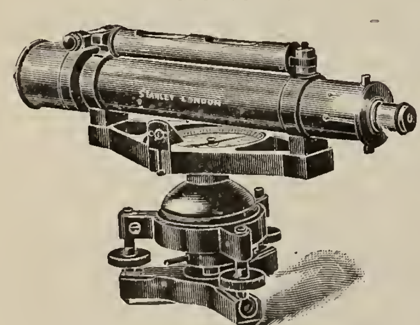

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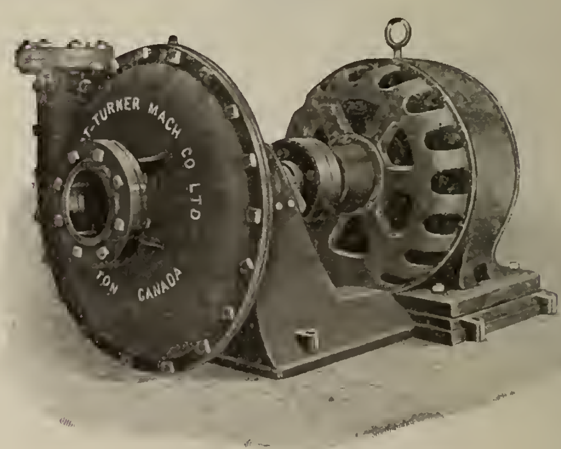

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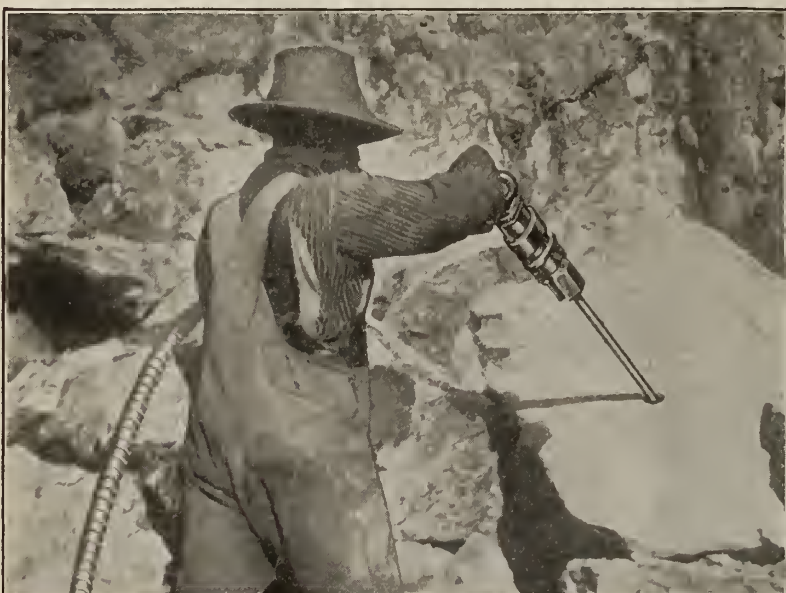

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## The Canadian Mining Journal

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CONTENTS.



## MERRY CHRISTMAS

To the readers of the "Canadian Mining Journal" we extend our best wishes for A Merry Christmas and A Happy and Prosperous New Year.

## WORKMEN'S COMPENSATION

A bill of considerable importance to mining men is that which Sir W. R. Meredith, Commissioner, has recommended to be passed into law.

It has long been recognized that employees should be compensated for injuries received while at work.

In general it is also recognized that the employer must pay the cost of accidents. There are, however, many cases in which the accident is caused by the carelessness of the employee, and then naturally the employer is unwilling to bear the burden.

Where the employer accepts responsibility there still remains to be determined what sum should be paid. Where the employer refuses to admit responsibility the injured must bring suit and then whatever the judgment a large portion of the money paid out by the employer does not reach the person injured.

In recognition of these facts and in an endeavour to revise the law so as to provide for fair compensation to the employee, a Commission was appointed, June 30, 1910, to investigate the compensation laws in force in other countries and to recommend a suitable law for Ontario.

A draft bill has been presented in April, 1913, and on October 31, 1913, the Commissioner made his final report to the Lieutenant-Governor of the Province.

In this final report, Sir William says:

"**At the outset of the enquiry it was contended by those who spoke on behalf of the workingmen:** (1) That the law of Ontario is entirely inadequate in the conditions under which industries are now carried on to provide just compensation for those employed in them who meet with injuries, or suffer from industrial diseases contracted in the course of their employment; and (2) that under a just law the risks arising from these causes should be regarded as risks of the industries and that compensation for them should be paid by the industries.

"**With these two propositions those representing the employers expressed their agreement,** though it is fair to say that it was probably not intended to agree that compensation should be paid in respect of industrial diseases."

It was not considered necessary to enquire into the statements of the workingmen, as employees, employer and the Commissioner agreed that the present law is inadequate. The best means of providing for compensation is, however, a subject which necessitates a great deal of study.

The Commissioner says:

"Agreeing as I did with the contention of the workingmen, there remained only to be considered in what form and by what means the compensation should be provided. For the purpose of reaching a conclusion as to this, and in obedience to the directions of the Commission, I made enquiry as to the laws in force in the principal European countries, in the United States of America and in the Provinces of Canada. I also visited Belgium, England, France, and Germany, and consulted those concerned in administering the laws of those four countries, and others qualified to judge as to whether they have been found to work satisfactorily. Much evidence has been taken bearing upon the general question."

Of the various compensation laws in force in these countries he says:

"**There are two main types of compensation laws.** By one of them the employer is individually liable for the payment of it, and that is the British system. By the other, which may be called the German system, the liability is not individual but collective, the industries being divided into groups, and the employers in the industries in each group being collectively liable for the payment of the compensation to the workmen employed in those industries—practically a system of compulsory mutual insurance under the management of the State. The laws of other countries are of one or other of these types, or modified forms of them, and in most, if not all of them, in which the principle of individual liability obtains, employers are required to insure against it."

The representatives of the workingmen and the Canadian Manufacturers' Association agreed on the German system as the most suitable; but disagreed as to some of the details.

"The employers insisted that a part of the assessments to provide for the payment of the compensation should be paid by the employees, and this was vigorously opposed by the representatives of the workingmen. The employers desired that no compensation should be payable where the injury to the workman did not disable him from earning full wages for at least seven days, and to this the representatives of the workingmen objected."

Mine managers in Ontario do not appear to be very much in favour of asking that employees be assessed and will doubtless not be much disappointed if this feature of the bill is not changed. The main contention of the mine managers is that the money paid out for accidents should go to the injured. At present much too large a percentage of it goes to those who conduct the suits for damages.

In comparing the British and German compensation laws the Commissioner says:

"After the best consideration I was able to give to the important matters as to which I was commissioned by Your Honour to make recommendations, I came to the conclusion, to which I still adhere, that a compensation law framed on the main lines of the German law with the modifications I have embodied in my draft bill is better suited to the circumstances and conditions of this Province than the British compensation law, or the compensation law of any other country. . . . It is in my opinion essential that as far as is practicable there should be certainty that the injured workman and his dependants shall receive the compensation to which they are entitled, and it is also important that the small employer should not be ruined by having to pay compensation, it might be, for the death or permanent disability of his workmen caused by no fault of his. It is, I think, a serious objection to the British Act that there is no security afforded to the workman and his dependants that the deferred payments of the compensation will be met, and that objection would be still more serious in a comparatively new country such as this, where many of the industries are small and conditions are much less stable than they are in the British Isles."

His opinion of the present common law is expressed as follows:

"**According to the common law it is a term of the contract of service that the servant takes upon himself the risks incidental to his employment** (popularly called the assumption of risk rule), and that this risk includes that of injury at the hands of fellow-servants (popularly called the doctrine of common employment). The doctrine of common employment is an exception to the general rule that the master is responsible for the acts of his servants when engaged in his work, and has rightly, I think, often been declared unfair and inequitable. **In my opinion there is no reason why this objectionable doctrine should not, as one of the provisions of Part II. of the draft bill provides, be entirely abrogated.** The draft bill also provides for the abrogation of the assumption of risk rule. The rule is based upon the assumption that the wages which a workman receives includes compensation for the risks incidental to his employment which he has to run. That is, in my judgment, a fallacy resting upon the erroneous assumption that the workman is free to work as he pleases and therefore to fix the wages for which he will work, and that in fixing them he will take into account the risk of being killed or injured which is incidental to the employment in which he engages.

"**Another rule of the common law is unfair to the workman.** Although the employer has been guilty of negligence, if the workman has been guilty of what is called contributory negligence and his injury was occasioned by their joint negligence the employer is not liable. The injustice of this rule consists in this, that though the employer may have been guilty of the grossest negligence, if the workman has been guilty of contributory negligence, however slight it may have been, and his injury was occasioned by the joint negligence, the employer is not liable. It is proposed by the draft bill to substitute for this rule that of comparative negligence as it is called, and provide that contributory negligence shall not be a bar to recovery by the workman or his dependants, but shall be taken into account in the assessment of damages."

A feature of the draft bill which was objected to by the Manufacturers' Association, and which will doubtless meet with further objection, is the providing for payment to continue as long as the disability lasts. Many would prefer to pay a lump sum and have done with it. The question involves not only one of actual compensation, but also that of cost of administration. It is quite evident that the staff required to keep track of the condition of all injured workmen and to determine when they are no longer entitled to payments, must soon become a very large one. The cost of administration will certainly not be small.

Against this argument, however, the Commissioner states that it is in these very cases of long lasting disability that a guaranteed compensation is most needed. He says:

"To limit the period during which the compensation is to be paid regardless of the duration of the disability, as is done by the laws of some countries, is, in my opinion, not only inconsistent with the principle upon which a true compensation law is based, but unjust to the injured workman for the reason that if the disability continues beyond the prescribed period he will be left with his impaired earning power or, if he is totally disabled without any earning power at a time when his need of receiving compensation will presumably be greater than at the time he was injured, to become a burden upon his relatives or friends or upon the community. The payment of lump sums is contrary to the principle upon which Compensation Acts are based and is calculated to defeat one of the main purposes of such laws—the prevention of the injured workman becoming a burden on his relatives or friends or on the community—and has been generally deprecated by judges in working out the provisions of the British Act."

The bill is divided into parts. Part I. deals with the liability of employers to contribute to the accident fund or to pay compensation individually. Part II. deals with liability and with certain common law rules and contributory negligence.

In Part I. there are two groups of industries listed, schedule 1,—industries the employers in which are liable to contribute to the accident fund; schedule 2,—industries the employers in which are individually liable to pay the compensation. Mining comes under schedule I.

While there is room for difference of opinion as to some of the details there should be little difficulty in convincing the Legislature that the bill should be passed. It provides in no uncertain terms for fair treatment for the injured. If a workingman meets with an accident while at work he should, if the accident be not the result of his own gross carelessness, be taken care of by the industry. The bill provides for compensation as long as the disability lasts. The workingman is virtually insured by the Government against accidents. The employers contribute to the fund. The bill provides for a board to administer it.

The concluding paragraph of the report will meet with the approval of all who have a sincere interest in providing for fair treatment of employees. The Commissioner says:

"In these days of social and industrial unrest it is, in my judgment, of the gravest importance to the community that every proved injustice to any section or class resulting from bad or unfair laws should be promptly removed by the enactment of remedial legislation and I do not doubt that the country whose Legislature is quick to discern and prompt to remove injustice will enjoy, and that deservedly, the blessing of industrial peace and freedom from social unrest. Half measures which mitigate but do not remove injustice are, in my judgment, to be avoided. That the existing law inflicts injustice on the workingman is admitted by all. From that injustice he has long suffered, and it would, in my judgment, be the gravest mistake if questions as to the scope and character of the proposed remedial legislation were to be determined, not by a consideration of what is just to the workingman, but of what is the least he can be put off with; or if the Legislature were to be deterred from passing a law designed to do full justice owing to groundless fears that disaster to the industries of the Province would follow from the enactment of it."

## THE MINES BRANCH REPORT

The summary report of the Mines Branch of the Department of Mines for the year 1912 has been issued.

The general report of the Director of Mines, Dr. Eugene Haanel, outlines the work accomplished by the various divisions.

The experimental investigation of processes for the profitable reduction of the mixed zinc sulphide ores of Canada, begun in 1910, is still being carried on. No very successful process has yet been found.

An investigation of the properties of cobalt and its alloys, carried on by H. T. Kalmus at the School of Mining, Kingston, has yielded some interesting results. Some extracts from his report will be found elsewhere in this issue.

Several reports on mineral resources and statistics have been published during the year and may be obtained on application to the Director of the Mines Branch.

The new testing laboratory at Ottawa has been equipped for experimental ore dressing and the Department is ready to make investigation as to best method of treatment of ores submitted.

Preliminary reports on field work are presented by Dr. W. A. Parks, Dr. A. W. G. Wilson, Mr. E. Lindeman, Mr H. Frechette, Mr. H. S. de Schmid, Mr. L. H. Cole, and Mr. T. A. MacLean.

Mr. John McLeish reports on statistics; Mr. G. Middleton on the Assay Office at Vancouver; Mr. B. F. Haanel on tests on lignite coal; Mr. J. G. S. Hudson on sampling lignite; Mr. Edgar Stansfield on the Chemical Laboratory; Mr. A. Anrep on peat; Mr. F. G. Clapp on oil and gas, and Mr. Geo. Mackenzie on ore dressing.

The Mines Branch is doing a great deal of useful work. In the introduction to his report Dr. Haanel says:

"The Mines Branch of the Department of Mines was organized primarily for the purpose of assisting, in a practical manner, the development of the mineral industry of Canada. This object is attained by the gathering and publishing of statistics, relative to the mining operations and economic mineral resources of the country generally; by initiating and conducting original research work, which aims at the commercial utilization of our metallic and non-metallic minerals; by mapping out magnetic ore bodies by means of magnetometric surveys; by defining the characteristics and, in well-equipped chemical laboratories, determining the properties of specimen ores and rocks. Results of the work undertaken are given to the public in the form of monographs on the scientific study of the ore deposits of Canada; and by the publication of reports and bulletins dealing with the investigation of certain processes. As examples of this latter branch of the work may be cited the electric smelting of refractory iron ores; the production of peat fuel; the economic extraction of zinc from refractory zinciferous ores, etc."

Already the Mines Branch has published several important monographs and many reports and bulletins. Important investigations are being carried on. The Branch is doing well the work for which it was organized.

## THE EIGHT-HOUR SHIFT

In Ontario and in Michigan the law requires that, after January 1, underground workers shall not be required to work more than eight hours. Already in Ontario at some mines eight-hour shifts are the rule. At Cobalt, notices have been posted at several of the mines stating that the shifts are to be eight hours after January 1. In the Michigan copper mining district the eight-hour rule went into force on December 1, 1913.

The employees will doubtless be much pleased at the new regulations. Naturally the mine owners are not pleased at the prospect of increased costs of mining; but most of them are willing to do what they can to make life more enjoyable for the men in their employ.

A miner can do a good day's work in eight hours if he wants to.

## MINERS MURDERED IN MICHIGAN

Houghton, December 7.

The most vicious crime of the campaign of outlawry which has accompanied the Western Federation of Miners' strike was perpetrated at Painesdale at about 2 o'clock this morning, when two miners employed by the Copper Range Consolidated Company were murdered, a third mine employee was fatally wounded and a little girl was shot through the shoulder.

The dead:

Arthur Jane, aged 21, arrived in Painesdale yesterday from Toronto.

Harry Jane, aged 24, brother of Arthur, also arrived from Toronto yesterday.

Fatally wounded:

Thomas Dally, aged 40, miner and boarding-house proprietor.

The murdered and wounded were occupants of a double boarding-house on the west end of Baltic Street, one side of which was let to William Nicholson and family and the other to the family of Thomas Dally.

All were asleep when the shooting occurred save Mrs. Dally, who was waiting up for a boarder who was expected at 11 o'clock last night, but had not arrived at the time of the shooting. A bullet whizzed past her as she sat reading at a table and she screamed an alarm to the other occupants of the house. The shot was followed by a fusillade, one bullet entering the head of Mr. Dally, who had arisen from bed when his wife screamed, and Arthur and Harry Jane being shot dead in their beds. Little Mary Nicholson, aged 8, daughter of William Nicholson, was shot in the shoulder.

The two murdered men occupied a room in the third storey of the boarding-house.—Mining Gazette.

Houghton, December 9.

There seems no doubt that the State Department will be asked by the British Foreign Office to investigate the death of the Painesdale murdered men, Arthur and Harry Jane and Thomas Dally. These men were British subjects. The facts have been reported to the proper British consular and diplomatic authorities and an investigation undoubtedly will ensue.

Working men at Painesdale yesterday broke up the strikers' parade and then held an indignation meeting. They threaten the lives of the agitators, and trouble is feared. At Baltic 150 strikers were ordered to stop when crossing mine property.

Sunday was a most eventful day. In the morning several of the Houghton business men met at Houghton Club and formulated plans of action; after this meeting they adjourned to Houghton fire hall, sounded fire alarms for several minutes at a time, gathered together all of the citizens who could be reached for the purpose of getting the views of citizens in all walks of life.

Many speeches were made, and result was chartering of a special train over Copper Range and whole party going to Calumet, where they planned a similar meeting for the citizens there.

Result of the meeting was that next Wednesday is to be a half holiday with full pay and patriotic meetings will be held in the several copper country towns. Good speakers will be engaged and it is thought that before the week is over the agitators will find things too much against them to warrant their remaining. After they go it will be a simple matter, comparatively, to adjust differences between men and mining companies.

# A VISIT TO MINES OF ALBERTA AND BRITISH COLUMBIA

(Continued from November 1 issue.)

After examining the Granby mine the party proceeded to Greenwood. In the evening a visit was made to the smelter of the British Columbia Copper Company, which treats ore from several mines including the Motherlode mine at Deadwood. The copper deposits at Deadwood are, according to Mr. LeRoy, similar to those at Phoenix.

**Trail.**—Leaving Greenwood the party returned to Castlegar and thence to Smelter. Here was visited the smelter and lead refinery of the Consolidated Mining and Smelting Company. Recent changes and improvements in the plant were described by E. Jacobs in the August 15 issue of the Journal.

At Smelter, or Trail (the town of Trail lies just below Smelter), are treated the gold-copper ores from the Rossland mines and the silver-lead ores of the Slocan district. The product from the latter is refined silver and lead. The smelter is situated on the Columbia river a short distance above Trail creek.

"In the summer of 1890, Bourjois and Morris, who were working on the Lily May, crossed over to Red mountain and located in one day the Le Roi, Centre Star, War Eagle, Idaho and Virginia. These claims were recorded at Nelson, the Le Roi being given to E. S. Topping for paying the $12.50 recording fees. He secured specimens and went to Spokane, interesting some business men of that town in the Le Roi, and the development of the camp began. The news of the strike brought prospectors, and the Josie and most of the other claims whose names became so familiar were located shortly after the first discovery—many in the same month.

"Development was for the first few years slow, and the prospects of the camp uncertain. Lack of transportation and the financial panic of 1893 were the chief deterrent factors that nearly wrecked the fortunes of the camp. The first ore sent out of the camp was a small lot in 1891, which was packed to the Columbia river and thence shipped to an American smelter. In 1893, a wagon road having been constructed to Trail, on the Columbia, about 700 tons were despatched. The results were sufficiently reassuring to justify the erection of machinery, and with improved facilities, 1,856 tons of ore, shipped in 1894, returned $75,510. During the summer the Geological Survey, through Mr. R. G. McConnell, made a reconnaissance survey of the camp. Several of the more important properties were bonded for considerable sums and development was begun in earnest. The following year, the young camp received marked attention. The population rose from 300 to 3,000; railroad and smelting facilities were projected, and from this time forward, developments were rapid. The smelter at Trail and a tramway to connect it with Rossland and the mines, were begun in October, 1895, by Aug. Heinze, of Butte, and the first furnace was blown in the following February. In 1896 the Red Mountain railway, connecting Rossland with the Spokane Falls and

**On the Rossland Branch, C.P.R.**

**Rossland.**—From Trail the party were taken up the steep grade to Rossland which is 2,000 ft. above the Columbia river valley. Here excellent arrangements had been made to take the visitors through several of the mines including Le Roi, War Eagle, Centre Star, and Josie. Several small groups were formed and for each a guide was furnished. Each group was provided with plans of the workings. Underground the local geologists had in many places made conspicuous marks which enabled the visitors to find the contacts and identify the several formations. The time was thus used to best advantage.

**Development of the Rossland District.**—Although some of the placer miners who were working the creeks in the Boundary district had discovered evidences of mineralization on Red mountain and had done some exploratory work there, it was not until 1890 that claims were staked. The early history of the Rossland mining district is told by R. W. Brock in his report made for the Geological Survey:

Northern railway at Northport, was completed. Then came the inevitable wild boom. The evil effects of a boom are not confined solely to the thousands of dollars squandered in worthless property, the losses sustained by the innocents, and the damaged reputation of the district, but they are manifest in careless work on deserving claims, in a rash expenditure that may for some time survive the boom; in a loss of interest in properties of merit that only require additional work to demonstrate their worth; and in a tendency to maintain prohibitive prices on promising prospects by owners who have purchased during the period of inflation and are not prepared to accept a serious loss, or by owners who, once having experienced the sensation of being millionaires, are loath to accept present conditions, but prefer to speculate on the improbabilities of the future. Rossland has been called on to pay in full all the penalties attaching to a boom. The phenomenal rise in the value of Le Roi stock, the dividends declared by this company and the War Eagle, and the sale of the latter to Toronto capitalists, for the reported sum of $700,000, produced a feeling of buoyancy that afforded every opportunity to the unprincipled boomster and the amateur mining magnate, the public for the time being cheerfully swallowing whatever was offered. The inevitable slump followed.

"In 1897 Rossland had an estimated population of 6,000 and was incorporated as a city. A broad gauge railway was built from Trail to Robson, giving better connection with the Canadian Pacific railway than was afforded by river navigation along this rapid stretch of the Columbia. Stronger companies were formed to take over and develop promising prospects. In particular, the British American Corporation purchased the Josie, Nickel Plate, Great Western, Poorman, West Le Roi, Josie No. 1 and Columbia-Kootenay mines. Development work had yielded most promising results. The Le Roi Company, having completed its contract for 75,000 tons with the Trail smelter, erected its own smelter at Northport. In 1898 the Canadian Pacific railway purchased the Trail smelter and railway from Heinze, and immediately made an important reduction in smelting charges. The British American Corporation secured the Le Roi mine and smelter by purchasing the stock at a price which was said to represent nearly $4,000,000 for the property. The Centre Star was purchased by Toronto capitalists for $2,000,000 cash. The construction of the Crowsnest branch of the Canadian Pacific, built through the Crowsnest coal fields to Kootenay Lake, was an important event for the camp. It meant cheaper and better fuel and coke, and a consequent reduction in cost of ore production and treatment.

"These reductions brought about a large increase in ore tonnage with a corresponding diminution in the grade of ore mined. Large plants with the most approved machinery for the economical working of the mines, were installed or planned, and operations on a large scale were projected. The construction of the West Kootenay Power Company's plant at Bonnington Falls, 32 miles distant, was another important event. Electric power was now available for the Trail smelter and the Rossland mines, although full use has not been made by the mines of this most convenient and economical form of power. At the close of 1899, the reputation of Rossland suffered from the sudden collapse in the price of War Eagle stock. This stock had been run up to a wholly unwarranted point, and was held in the hope that new machinery would permit an increased output, with a resultant advance in the stock. Unfortunately the machinery proved a failure, and the stock dropped. A general desire to realize followed and brought about a collapse, with a consequent loss of faith in the camp. In 1901, Rossland again received a set-back, this time in the form of labour troubles, which closed up the mines for a part of the year. These difficulties were amicably adjusted, but the evil effects of such troubles in discouraging investments are not quickly effaced. By 1902 the mines had resumed their normal operations and on a more business-like basis than before. Although the great number, size and value of the ore shoots in these mines have been proved, and it is known that much lower grade ore can now be profitably worked, this has so far not had the effect that might be expected in encouraging the search for other pay shoots and new veins outside the area already developed. Experiments in concentration were commenced in 1903 and are still being made, and serious efforts are being made to obtain the greatest possible profit per ton of ore."

**Outcrop of vein, Centre Star mine, Rossland, B.C.**

**Characteristics of the Lodes.**—Some of the noteworthy features of the ore bodies have been pointed out by R. W. Brock in his report made for the Geological Survey:

"As is to be expected from the nature of these lodes, sharply defined walls are frequently lacking, the mineralization of the country rock gradually becoming less. Sometimes a fissure or fault plane bounds the ore, but often where this is the case, the slip has been formed after the mineralization. The transition from pay ore to what is—from a commercial standpoint—waste rock, is generally rapid, but such change is not proof that pay ore does not exist beyond the poor material. The pay ore is localized in shoots distributed within the lodes. These shoots vary greatly in size and shape. Lenticular bodies are commonest, but some terminate abruptly against a dike or fault, sometimes swelling to an enormous width or becoming L-shaped against the dike. In width, they vary from a foot to, in exceptional cases, 130 feet; in length, from 50 to 500 or more feet, and the vertical dimension is on an average the greatest. Stopes, 250 feet long by 20 to 30 wide, are by no means uncommon. One shoot of ore that has been followed down nearly 500 feet vertically, has averaged at least 150 feet long by 56 feet wide, and this is not the largest shoot that has been developed. The pitch of the shoots in the lodes varies from vertical to pronounced easterly or westerly and seems dependent upon purely local conditions. In the shoots themselves, the better grade ore is often confined to particular bands, which are generally parallel to the vein, but which may lie along either wall or within the shoot; more than one such band may be encountered in running a cut across a shoot. The position of such rich bands in the lode may suddenly change, owing to the mineralization forsaking one set of planes for another. In the Le Roi and Centre Star, where there are two important parallel lodes—the "Main" and "South" veins—it would seem, in the light of present developments, that where important shoots occur in the one vein, heavy mineralization is lacking at the corresponding point in the other. It is sometimes difficult to trace the vein from shoot to shoot, particularly where its continuity is interrupted by faults and dikes. In the Le Roi-Centre Star Main vein, a seam of calcite extends almost uninterruptedly along the vein, and occasionally forms a useful indicator where mineralization is slight."

**On the C.P.R. in British Columbia**

**On the C.P.R. at Glacier, B.C.**

**Methods of Mining at Rossland.**—In the mines visited by our party the ore is extracted for the most part by the use of square sets. In some cases, however, the shrinkage method is used. In the Josie mine a narrow rich shoot is being extracted without using square sets. As a rule the ore and rock are very hard. The veins dip at an angle of about 70 degrees. The shrinkage method can be used to advantage where the stoping width is not great. The ore bodies, however, are commonly wide, being in places over 100 feet, and timbering by the square set method has proven to be satisfactory where the shrinkage method cannot be used.

The Rossland mines have produced very large quantities of gold and copper ores and it was pleasing to find that the owners have received considerable encouragement from the deeper explorations which have recently been carried on. Several of the engineers stated that there is good reason to expect a large output from the deeper levels.

After spending the afternoon underground the members of the excursion were entertained at the Rossland Club, and at the several hotels. The citizens of Rossland bore out the statement made by Director Brock at Fernie that the people of the west, and especially those of the mining districts are unsurpassed for their hospitality.

# THE GOLD DEPOSITS OF NOVA SCOTIA

By E. R. Faribault.

(Continued from Nov. 15 issue.)

**Ore Distribution.**—Not all the veins are auriferous. The coarsely crystalline quartz seldom carries gold, while the laminated veins of oily quartz-bearing sulphides, generally do. In a few auriferous veins the gold seems to have had a fairly uniform distribution, but experience has shown that in most of them there was more or less segregation into pockets and shoots.

Some of the richest ore mined has been found n pockets. In the Blackie lead at Oldham the gold was found aggregated chiefly in nodules of arsenopyrite; and in the Hay lead, lying 1,800 feet (584 m.) north of the anticline of the same district, an isolated pocket carrying 60 ounces of gold was found at the intersection of an angular with the main lead.

The great proportion of the ore, however, lies in shoots having more or less definite boundaries and directions. They vary from 20 to 60 feet (6 to 18 m.) or more in breadth and are frequently accompanied by a thickening of the vein. In interstratified veins, many shoots have been worked to a vertical depth of 300 and 400 feet (90 to 120 m.). A shoot on the Hard lead, South Uniacke, was followed 1,200 feet (360 m.) on a dip of 28 degrees east; while that in the Sterling Barrel lead, Oldham, has been worked to a depth of 1,610 feet (487 m.) on a dip varying from 30 degrees at the surface to 43 degrees at a vertical depth of 900 feet (275 m.), and in 1909, the ore averaged 2.88 ounces per ton. The latter is the deepest mine on an interbedded vein.

Several shoots in cross veins have also been mined to a vertical depth of 200 and 400 feet (60 and 120 m.), and two, to a vertical depth of 1,000 feet (300 m.); one of these was worked throughout a length of 2,000 feet (610 m.).

As a rule, ore shoots occur in the rolls that have been already described, that is those parts of the veins in which there is some irregularity in size, form, structure or composition.

The interbedded leads are frequently found to be very rich at their intersection with angulars as well as in the thickened parts lying between the lines of intersection with angulars from below and above. All angulars do not enrich the leads they cut, and frequently only a set coming from some one particular direction have favoured the enrichment of the leads. The angulars themselves are usually not auriferous, but some have proved gold-bearing, especially in those parts where they cut obliquely across slate beds.

There is some order in the distribution of the ore in belts; in some, all the veins are auriferous, in some, only one, and in others, one vein will be auriferous for some depth, then becomes barren and an adjacent one becomes auriferous.

That there is some order in the distribution of the ore shoots was pointed out by Poole as early as 1878. A study of the plans made by Faribault of the different gold districts, reveals an alignment or arrangement of the outcroppings of the ore shoots in nearly every district. In the case of sharply folded anticlines, the line of ore shoots runs roughly parallel with the axis or diverges slightly from it, radiating from the centre of the dome, while in broad folds the line diverges still more from the axis. The shoots pitch in the general direction of the pitch of the anticline and at about the same or a little higher angle.

In some veins two or more parellel shoots have been found. The ore shoot on the Hard lead, South Uniacke, really consists of two streaks lying 40 feet (12 m.) apart; in the Mulgrave lead, Isaacs Harbour, a shoot 30 feet (9.1 m.) broad lay 180 feet (54.7 m.) below another 12 feet (3.6 m.) broad, both pitching west at an angle of 12 degrees.

The distribution of the shoots is frequently dependent on some subordinate flexure or crumple in the strata. For example, the large series of ore bodies worked at Renfrew is due to a subordinate undulation in the strata on the south limb of the dome. In this regard each district has its individuality, the structure of one dome never being just the same as that of another. The distribution of the ore shoots, consequently, is never exactly the same in any two districts.

In cross veins the ore body is found, in some cases at least, to lie at the intersection of the vein with certain strata or main leads. At Cow Bay, the ore body dips south at the same angle as the strata and follows certain beds at the base of the Halifax formation, highly charged with pyrrhotite. The shoot, followed 2,000 feet (610 m.) in the Libbey vein, extended from its intersection with the Mill lead on the north to the vicinity of its intersection with the Jim lead on the south.

**Pay Zone.**—Certain facts point to the existence in most districts of zones extending to a considerable depth, in which a succession of auriferous, interbedded, quartz veins of similar character and extent lie superimposed one above the other. On the north limb of the anticline at Goldenville several parallel veins lying close together pass under one another, and each has been worked to some depth beneath the overlying veins. An example of superimposed saddle-shape ore bodies on the apex of the anticline is found at Isaac Harbour, where the workings of the Burke lead were carried below those of the Archie, McPherson and Saddle leads. So also at Mount Uniacke, a series of ore shoots was worked on the West Lake, Nuggety, Little and Borden leads, where they are affected at successively greater depths by a subordinate crumple with an axial plane dipping north at a high angle.

The observation of these and numerous other relations led the writer to the propounding of the "pay-zone" theory.* As has been pointed out the distribution of ore-shoots is dependent on the structure of the anticlinal fold or subordinate flexures on the fold: they lie in a line passing through similarly curved or twisted portions of the strata that during the folding process were subjected to pressures and tensions and were fractured so as to permit the transmission and deposition of minerals. The subordinate flexures and peculiarities of structure, on which the distribution of ore-shoots depends, extend to an unknown depth, and it is claimed that interbedded veins and ore-shoots should succeed one another with depth so long as the same structural conditions continue as at the surface. These structural conditions generally extend in depth parallel to the axial plane of the dome. We thus get a pay-zone the surface extent of which coincides with the surface over which the ore-shoots outcrop and which extends parallel with the axial plane of the dome to an indefinite depth.

The evidences in favour of the theory are the fact that gold mining has been carried on in the province to a vertical depth of 1,000 feet (300 m.) in fissure veins and 900 feet (275 m.) in one interbedded vein; that pay-ore is not limited to any particular horizon, but has been mined throughout the whole thickness of the Goldenville formation; and the analogy existing between the interbedded veins of Nova Scotia and the saddle-reefs of Bendigo, which have been worked successfully to a depth of over 3,000 feet (900 m.) and proved auriferous at over 5,000 feet (1,525 m.).

While the hypothesis may be of general application it is not claimed that it will hold in all particular cases. Structural features vary with depth; subordinate folds may not persist and main folds may flatten and thus the pay-zone may die out or be shifted in position with regard to the anticlinal axis. For example, in the case of the Dufferin mine, rich ore was found at the apex of the fold at the surface, but in the underlying veins owing to the flattening of the dome it was more remote from it.

Genesis.—Some of the earlier investigators such as Hind and Hunt, maintained that the interstratified veins are syngenetic, that is, were formed contemporaneously with the containing rocks, but later students of the Nova Scotia gold fields are thoroughly convinced that they are epigenetic, i.e., deposited subsequently. That the cross-veins are of later origin all are agreed.

Campbell, the pioneer in the gold fields of the province, expressed the opinion that the veins were of later origin than the rocks, and Selwyn and Poole were strong supporters of his theory. The opinion that prevails to-day is that the veins were formed during the folding of the rocks, in the openings produced by the movements of the strata. During the folding of the interstratified beds of slate and quartzite, or shale and sandstone, there was a certain amount of slipping of one bed over another. This slipping produced openings along the bedding planes, which were in general widest at the apex of the folds, and decreased in width with depth along the limb until at a depth of a few hundred feet they pinched out. During or subsequently to the formation of these openings, which took place within the less resistent beds, the vein filling was introduced by solutions. Thus is explained the dependance of vein distribution on rock structure.

The arching of the rocks on closely folded symmetrical domes produced fissures passing over the apex and down each limb; on broad domes the arches were not strong enough to sustain themselves and the fissures were formed only on the limbs; on unsymmetrical domes the slipping of the strata was such as to produce fissuring along the bedding planes of the limb with the higher angle of dip; and subordinate flexures, in which the strata were given a curve of less radius than ordinary, were especially favourable to the production of fissures.

The process of folding was long continued and the deposition of vein matter probably took place during the process. Small fissures were formed along the bedding planes and filled with quartz only to be followed by other parallel openings between the quartz sheet and the slate and further precipitation of quartz in the new openings. Films of slate adhering to the quartz forming the wall of the new fissure thus became embedded in the vein. A succession of such events produced the laminated character of the interstratified veins. It is also probable that in many cases the quartz was deposited in the slate along a number of parallel planes lying close together in an area of minimum pressure and that the quartz film increased in thickness through a widening of the spaces either by the folding of the strata or by metasomatic replacement.

The bulk of the evidence shows that the veins were filled by ascending solutions of a deep-seated origin. These found a passage upward through the fractured portions of the domes. A fracturing across the bedding as well as fissuring along the bedding planes seems to have been necessary for the formation of veins and ore deposits: veins are not commonly found along straight non-pitching anticlines although there was, no doubt, a great deal of fissuring along the bedding planes; on the other hand, where the anticlines pitch and the rocks were fractured across the bedding, veins are abundant. The cross fractures are themselves filled with quartz forming the angulars entering and leaving the interbedded veins. The cross fractures seem therefore, to have provided channels for the passage of solutions across the beds of quartzite and slate to the interbedded fissure along which deposition took place. That the solutions entered by way of the angulars is borne out by the fact that the rich portions of interbedded veins are those portions lying between the line of entrance of an angular and the line along which it leaves the main lead.

Briefly stated, the observed facts seem to be best explained on the theory that the veins are epigenetic, that they were formed by the deposition of quartz, sulphides and gold in cross fractures and interbedded openings occurring chiefly in the black or pyritous slate beds of the Goldenville formation, that the conditions necessary for the formation of the veins were a great deal of fracturing across the bedding planes, permitting the passage of ascending thermal solutions and that these fractures were produced where the two horizontal orogenic forces manifested themselves in the formation of domes or the pitching of the anticlines.

*Geol. Surv. Can. Vol. v, p. 57 A. A. and Vol. x, p. 108 A.

# THE SHIELDS-THIELMAN SECTIONAL JIG CLASSIFIER AT QUINCY MILL, MICH.

Among the changes made in recent years in treating Michigan copper ores some of the most important are improved methods of classifying the product from the stamps. The jigs devised are remarkably efficient machines and treat an enormous amount of material in a short time.

Recently at the Quincy mill a very satisfactory classifier of a new type has been devised. This is a sectional hydraulic jig classifier, which is making a remarkable recovery of the copper of all sizes and classifying the remaining material for treatment in regrinders and on tables.

The following is an authentic description which has been published in the Mining Gazette:

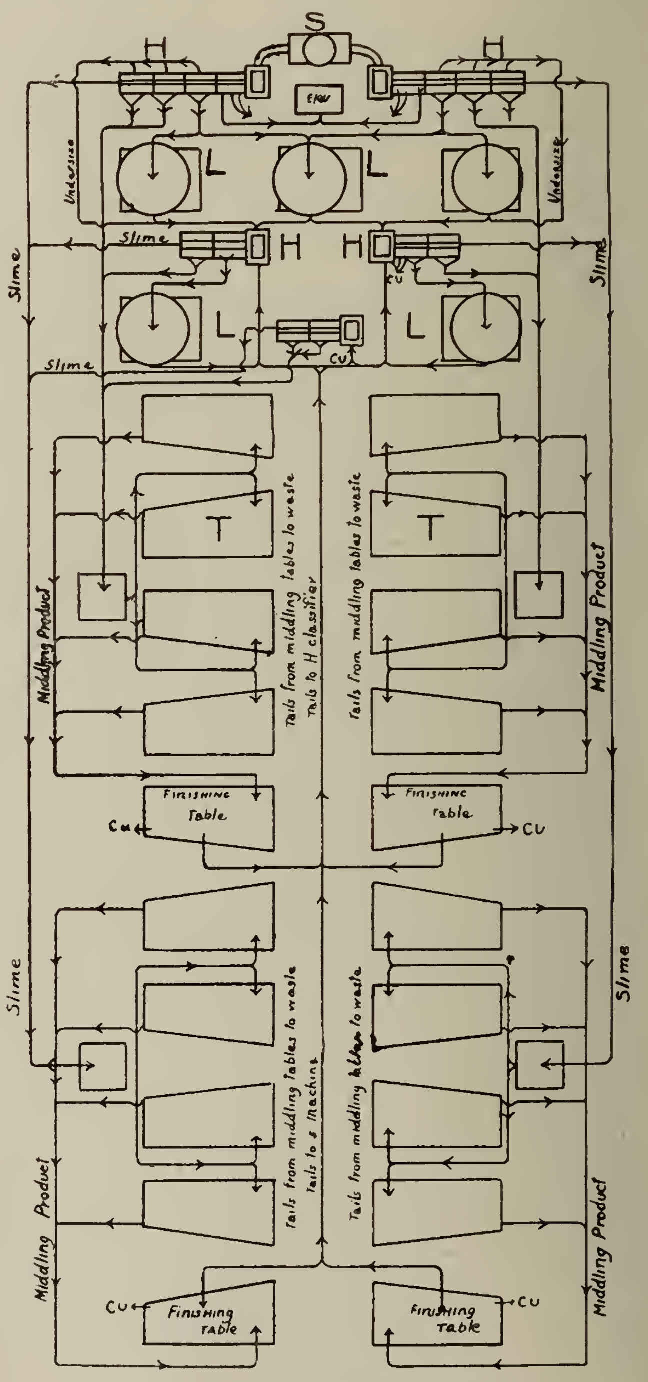
"A machine has been designed at the Quincy stamp mills that tends to revolutionize the treatment of the so-called roughing floor material or roughing jig material where at least 60 per cent. of the losses from all the mills are. It has been in successful operation for eight months and the results have been better than expected. The machine takes up a space of about 12 ft. by 4 ft. and has a capacity of 500 tons.

"At the present time the machine is taking the mixed feed direct from the stamp, the feed coming through a ⅝-inch grate and running direct into the machine. The trommel screens have been discarded together with all the shafting, belting, gearing, etc., that goes with it, also the ponderous bull jig together with its shafting, hangers, belting, etc. The roughing jigs can all be discarded as this machine does all the work of the roughing jigs also. It sorts or classifies the material in about 20 different classifications and at the same time takes out between 65 to 70 per cent. of the total copper direct from the stamps, copper ranging in size from ⅝ down to table copper.

"This simplifies the present practice as the copper at the mills on Lake Superior is scattered all over the different machines, amounting in some cases to as many as 20 to 30 on the roughing floor alone. This machine by taking out so much copper and sorting out the material to be ground, and confining it in a small space simplifies the treatment of the roughing material to a very great extent. Grinders can be placed directly in front of this machine on the roughing floor, and the material coming from the different plugs can be sampled, assayed, and, if rich enough to be ground, can be turned directly into the grinding machines after the free copper has been taken out. This treatment is very simple.

"The problem is to gather together material worth grinding and discard material practically worthless, or in baseball parlance, let the bad ones go by and hit the good ones hard. This has been accomplished to such an extent with the machine that it is hardly believable. The machine takes only from three to four horse power as against 25 to 30 horse power on the present mill practice to do the same work, and a space of 12 ft. by 4 ft. against a space of 40 by 25 ft.

"The machine is called a sectional positive jig classifier, and is made up of a number of sections that can be added to at any time without dismantling the machine. The several sections are divided into pockets of 6 by 12 and 12 by 12 in size, each having a positive plunger, and an independent adjustable stroke. This is very essential in the treatment of the different sizes of material ranging from ⅝-inch to 100 mesh. The plungers are all made of brass, and each plunger carries an oil bath inside, submerging the pin on the plunger at all times in a bath of oil. The plunger cas-




**Flow Sheet of Proposed Mill for Treating Michigan Copper Ores.**

**S—Steam Stamps. H—Shields—Thielman Classifier.**
**L—Regrinding Machines. T—Concentrating Tables.**

ings are made of cast iron, and are independent of each other, and can be removed or replaced at any time if necessary in quick time.

"The sections are lined with a cast iron box to protect the sections proper from wear. They conform as to shape with the partitions in the hutch pockets. Each pocket has a plug of its own, and the material from each pocket is discharged independently. The present roughing jig practice in the mills is more or less crude, inasmuch as there is material going down on the roughs that should go on tables and into a grinder instead. To mix this material on the roughing jigs and afterwards is a difficult proposition, as it cannot be positive, and requires careful watching. The one great object of this machine is to get copper quick, and to sort out the material that is ground without scattering both copper and the to-be-ground stuff all over the mill. Another object is to get rid of the trommel screens, bull jigs, roughing jigs, hangers, shafting, sieve frames, plunger-boards, skimming, sieve wire, and all that goes with the present-day lay out. Both objects have been accomplished."

Mr. Jas. Shields, superintendent of the Quincy mill, claims that the copper stamp mill of the future will contain none of the usual jigs, trommels and classifiers, and gives the accompanying flow sheet as an example of the new type of mill in which the machinery is essentially, stamp, sectional jig, classifier, regrinder and tables.

# BRITANNIA MINE, HOWE SOUND, B.C.*

By R. G. McConnell.

The group of mineral claims owned by the Britannia Mining and Smelting Co., and known as the Britannia mine, is situated in the Coast range east of Howe sound about 20 miles directly north of the City of Vancouver and 28 miles following the steamer route along the coast. Howe sound is an irregular fiord, cutting well back into the Coast range, and is bordered along its whole length by rugged mountains and high ridges. The claims now being worked are situated on a steep ridge, about 4,300 ft. in height, separating Britannia creek from Furry creek. The principal workings are in the north slope of the ridge at a distance of three and a quarter miles from the coast and at an elevation of 3,275 to 3,775 ft. above sea level.

**Rocks.**—The Coast range is built predominantly of granitoid rocks, mostly coarse quartz diorites or granodiorites, but contains at various points a number of inclusions of the older rocks invaded by the granitic magma. There vary in size from small angular fragments, a few feet across, to wide bands extending along the range for miles. The mineralized zone at the Britannia mine occurs in an inclusion or undestroyed area of the intruded rocks from one to two miles in width and running southeasterly from Howe sound for a distance of more than seven miles.

The rocks in the inclusion consist largely of slate, alternating with a dark intrusive, probably a diorite porphyry, usually crushed and altered into a greenish chloritic schist. Volcanic rocks, mostly porphyrites and hardened fine and coarse fragmentals, occur near the northern border of the inclusion.

The slaty rocks, when unaltered, are dark in colour and contain considerable carbonaceous matter. They are seldom regularly cleaved except for short distances and in places pass into fine-grained quartz biotite schists. A hard quartzitic variety due to silicification is common, and alterations into grayish and silvery white quartz sericite schists occur over large areas.

The crushed dioritic intrusive is economically the most important rock in the group. It forms the country rock at the Britannia mine and is also heavily mineralized at other points. It alternates with the slates and their altered equivalents, the sericite schists, in bands and lenticular areas ranging from a few feet to more than 1,000 ft. in width. Like the slates it exhibits varying degrees of alteration, often passing in a short distance from a hard, irregularly joined, gneissic rock to a soft, greenish, well foliated, micaceous schist. A light green variety, spotted conspicuously and fairly regularly with dark green chlorite films often half an inch or more in length, forms the principal country rock along the mineralized zone at the Brittania mine. The origin of the green films has not been definitely determined. They may represent crushed ferro-magnesian phenocrysts, but possibly are derived in part at least from small fragments of slate included in the intrusive and subsequently crushed and altered.

Dikes genetically connected with the surrounding Coast Range batholithic rocks, usually abundant in inclusions, are rare in the Britannia area, except near the contact.

An excellent section of the alternating slates and crushed intrusives is afforded by a tunnel driven from Britannia creek at an elevation of 2,100 ft. above sea level southward diagonally across the strike of the rocks for a distance of 4,200 ft.

**Mineralization.**—Mineralization at the Britannia mine is on an extensive scale. The deposits are of the replacement type and are formed along wide, irregularly fissured zones, enclosed in and striking with the greenstone schists. The most conspicuous croppings occur in the Jane and adjoining claims to the east and consist of two high iron-stained bluffs, about 1,000 ft. apart, facing each other across the drift-covered bottom of Jane Creek valley. The mineralized zone exposed in the two bluffs consists of silicified schists impregnated with iron, copper and zinc suphides, and has a width in the eastern or Mammoth bluff of fully 200 ft. It undoubtedly extends across the concealed interval separating the two bluffs and may be considered to have proved minimum length of 2,000 ft.

East of the Bluff mineral zone a number of disconnected croppings occur in the steep mountain slope covered by the Fairview claim. A tunnel driven under these from the Mammoth bluff at a depth of about 1,000 ft. below the crest of the ridge resulted in the opening of a second important mineral zone, practically a continuation of the Bluff zone, but separated from it by a short lean stretch. The strike is also 30 degrees more to the south. Development work on the second, or Fairview zone, is still in progress, and its full dimensions have not been ascertained. The work done up to the present has shown it to have a minimum width of fully 500 ft., made up of bands of commercial ore, separated by barren, or nearly barren, schists. Drifts have been carried along the zone for a distance of 1,200 ft.

*Appendix to International Geological Congress Guide Book No. 8, published by Geological Survey, Canada, 1913.

**Minerals.**—The metallic minerals in the Britannia ore bodies consist of pyrite, chalcopyrite, considerable zinc blende in certain areas, and rarely some galena. Small quantities of black oxide of copper and bornite occur as alteration products, but are nowhere abundant. The gangue is principally the greenstone schists forming the country rock, more or less silicified. Small quartz veins, generally following closely the direction of the schistosity, but frequently cutting directly across it, are numerous.

Calcite in very small quantities is occasionally present and some fluorspar has been found.

**Ores and Ore bodies.**—The wide Bluff mineral zone originally worked is practically a low-grade copper deposit throughout its whole extent. Pyrite, in masses, disseminated grains, and in veinlets through the silicified country gangue, is the most abundant mineral present. Chalcopyrite, in small lenses, veinlets, and scattered grains, occurs with the pyrite, but in much smaller quantities, and in places a notable percentage of blende is present. No mining is at present being done on this zone. A considerable quantity of ore was mined and concentrated before the discovery of the Fairview zone, but the venture was not commercially successful. Since then transportation to the coast has been improved and better methods of treatment largely increasing the recovery of metal have been adopted, so that the ores could probably now be mined and treated at a fair profit. The average tenor in copper is about 1.5 per cent.; in addition the ores contain 0.5 to 1 oz. in silver, and in the western portion of the zone, 40 cents in gold.

The character and distribution of the ores in the Fairview zone differ markedly from those in the Bluff zone. The chalcopyrite, the principal valuable mineral present, in place of being disseminated more or less irregularly through the whole width of the zone, is concentrated along certain lines in fairly definite ore bodies, ranging in width from a few feet or more, which have proved very persistent. The ore bodies are not confined between walls and are marked mainly by a more or less complete cessation of both metallic and non-metallic mineralization. They are approximately parallel, but occasionally diverge or unite at low angles. The dip is to the south, at an angle of about 70 degrees and is conformable or nearly so to that of the enclosing schists. In the present workings, six ore shoots have been encountered and followed for varying distances up to 1,000 ft. The vertical range has been proved for 500 ft.

The chalcopyrite in the ore bodies occurs characteristically in fairly large, nearly pure, aggregates, usually as short lenses, occasionally a foot or more across, in stringers interleaved with or cutting the schists at a low angle and in reticulating veinlets penetrating the silicified schists in all directions. Only a small percentage occurs in disseminated grains. The quantity present varies in the different ore bodies and along the dip and strike of the same ore body. The general average tenor in copper of the whole system of leads is given at 2.5 per cent. The silver content is small, amounting only to about 0.5 oz. per ton, and gold occurs only in traces.

The proportion of pyrite present is much smaller than in the Bluff zone, and zinc blende, prominent in the latter, is absent.

The production in 1912, according to published statements, amounted to 193,000 tons, yielding 14,300,000 lbs. of copper, and 76,500 ozs. of silver. The present production is approximately 600 tons per day, the full capacity of the present transportation facilities from the mine to the mill.

**Development.**—The Fairview mineral zone has been opened by five levels at elevations of 1,050, 850, 700, 600, and 500 ft below the summit of the ridge into which they are driven. The levels, with numerous crosscuts and raises following the ore bodies, serve to explore the zone for a distance of 1,200 ft. along the strike and 500 ft. along the dip. A long tunnel at a depth of 1,200 ft. below the present lowest level, starting from Britannia creek and running toward the ore zone, is now completed to a point beneath and a short distance west of the ore bodies worked. This will be connected in the near future with the upper workings by a large 3-compartment shaft and an ore chute. The extension downward of the ore bodies below the 1,050 level can be reached from the shaft by short crosscuts.

**Treatment of Ore.**—The chalcopyrite in the Fairview ore bodies occurs as a rule in fairly large aggregates, often separated by considerable waste, and the material mined is concentrated before shipment. The ore is crushed at the mine and transported to the concentrating mill at Britannia Beach by an aerial tramway built in two sections, with a daily capacity of about 600 tons. At the mill it is first washed in a 4 by 6-ft. trommel with 1½-in. perforations. The over-size discharges on to a sorting belt, and about 50 tons of 12 per cent. ore and 150 tons of waste are picked out daily from the 600 tons received. The milling ore, except the undersize from the washing trommel, passes from the conveyor to a Blake crusher, and then through a series of spring rolls, which reduce it gradually to the size required, about 2mm., for treatment in Hancock jigs. The greater part of the sulphides is separated out in these machines.

**Flotation Process Used.**—The tailings and the undersize from 1½mm. trommels are ground in Hardinge pebble mills to a 40-mesh or smaller size, and subjected to the Minerals Separation Co.'s flotation process, the details of which are still kept secret. The Hancock jigs used are of the Anaconda type and the separation of the sulphides by them, followed by the use of the Minerals Separation process on the finer material, has given excellent results, only a very small percentage of the sulphides escaping. The concentration is in the ratio of 4 to 1.

**Equipment.**—The present equipment is inadequate to the needs of the mine, and extensive improvements and enlargements are being made. A new concentrating mill with a daily capacity of 200 tons is contemplated, and work is in progress on a system of transportation of the ores from the mine to the Beach, which involves the construction of a double-track gravity tramway a mile in length with an average grade of 15 per cent.; a switchback track five miles in length with a 3 per cent. grade on which gasoline locomotives will be used; a 9 by 12-ft. tunnel, 3,600 ft. in length; and a 1,200-ft. vertical chute connecting the tunnel with the present workings.

Water power developing 1,800 h.p. from Britannia creek is largely used to operate the mill, compressors and other portions of the extensive plant, and this, with 650 h.p. obtained from steam, is ample for present requirements.

# THE PHYSIOLOGICAL CHARACTERISTICS OF ACETYLENE WITH RELATION TO ITS USE AS AN ILLUMINANT IN MINES*

By E. E. Smith, Ph.D., M.D.

A modern philosopher has told us that life is the continuous adjustment of internal relations to external relations. This means, in less abstract language, that to live we must adapt ourselves to our surroundings. So long as we are able to do this, we live healthful lives. When we are unable to do so, ill-health and death supervene.

Civilization has modified in many ways the external conditions to which we must adapt ourselves. Tent life which was native to the tribe has now very largely given away to house life. That this change has involved adaptation to the new external conditions is illustrated at the present time by the American Indian. With him it appears too often that house life means being domiciled in squalid cabins surrounded with accumulations of filth which becomes the source of disease, conditions that do not exist with the fresher air, ventilation and the frequent change of site of tent life. In order that the change be beneficial, it is important to so regulate the civilized form of living that by avoiding these unhygienic conditions civilization be brought within the capacity of adaptation of the Indian.

This somewhat primitive illustration indicates the general law that new external conditions, without regard to the fact that they mark a signal advance in civilization, must be scrutinized with whatever care may be necessary to determine what is to be avoided that the new conditions may be established to our benefit. It is in this spirit, or at least it should be, that every economic advance receives attention. What are the problems of adjustment which it presents and how may they be solved so as to reap the benefit of the advance and avoid possible disadvantages?

With illuminants, the problem of adjustment have ever been definite and impelling. What concern was in the minds of the generations who worked out the problems presented by the evolution of the candle we need nothing more than conjecture. It may be that the ember of the rosin pine knot gave way to the dip in the candle without apprehension on the part of the housewives of the times, but what we know of human nature strongly suggests that the fear of spattering, the danger of clothes and hangings being fired, the matter of the formation of soot and the possibility of the extinction of the flame by draughts were problems quite as serious to the era of the candle as have been those presented to later generations by the advance which they have witnessed.

The working out of some of the problems presented by the use of oil is within our memory. The newspapers of fifty years ago gave many accounts of lamp explosions with disastrous fires, involving loss of property and life. It remained for the oil chemist of that day to point out the necessity of fractioning the oil, separating the highly volatile and explosive lighter oils and securing the safer and more efficient fraction for use as an illuminant.

The problems of adjustment in the use of common illuminating gas are yet with us. Its poisonous action has by accident ended thousands of happy lives and by intent perhaps as many unhappy ones; and is continuing to do so and, indeed, from its nature must so long as it is used. Its use has been an important factor in the development of modern city life, but it has not been without its price.

So, too, we must acknowledge the loss of life associated with the use of electricity. The innocent wires that transverse our streets and buildings have been and still are the cause of many conflagrations and violent deaths. The brilliant light thus shed by which night is made day is not without its list of fatalities.

Indeed, the fact of new external relations must inevitably carry with it the problems of the adjustment to the internal relations that constitute life. Such adjustment must be continuous. It is necessary and important to every advance to recognize the new external relations that they may be maintained within the capacity of adaption to internal relations, so that their benefits may be realized and their dangers avoided.

Let us, then, in the time at our disposal, look at some of the problems of adjustment presented by the modern use of acetylene as an illuminant.

**Acetylene is not a direct poison.**—Though the division of our subject naturally first directs attention to the carbide or acetylene production as any industry, we shall limit our attention to the problems of adjustment presented by the use of acetylene as an illuminant. This leads us at once to the inquiry, Is acetylene a direct poison? The answer is no. This question is asked with some seriousness, however, because on the one hand of the notoriouly toxic action of common illuminating gas, due to the carbon monoxide which enters so largely into its composition, by reason of which the mind of the inquirer is already not only prepared to believe that acetylene is poisonous, and in fact, in some instances has that idea rigidly implanted there. It is further asked with seriousness, because, in the literature of the subject, we find some views that it is poisonous. Early writers declared that it combined with the blood and had a marked poisonous effect, like carbon monoxide.

**It is capable of doing injury.**—Any gas, when it replaces air, if incapable of supporting respiration, is injurious and even fatal, not because it is poisonous, but because it deprives the body of oxygen. Because of this, acetylene is capable of doing injury. If it accumulate in some small, unventilated space, like the cabin of a boat, it is entirely capable of shutting off the supply of air, of preventing respiration and hence harm and even death. It suffocates because it is incapable of supplying oxygen without which man cannot live.

When acting in this way, acetylene is not a direct poison; it does not do anything to the body that injures it. It does harm only indirectly by withholding air,

*A paper read at a recent meeting of the International Acetylene Association.

The recognition, then, of injury by suffocation throws no light on our inquiry whether it is a direct poison. The presence of common illuminating gas in air even to the amount of a fraction of a per cent., is distinctly injurious and may even be fatal, though such air contain an abundance of oxygen. The carbon monoxide contained in the illuminating gas enters the blood through the lungs and attaches itself strongly to the coloring matter of the blood, rendering it incapable of taking up the oxygen of air though the air contain oxygen in sufficient amount. Thus death supervenes not because the body is denied oxygen, but because through the fixation of the coloring matter of the blood, it has lost its capacity to use oxygen. Has acetylene this or any other directly poisonous action? Some early observers said it had. They found fixation of haemoglobin quite similar to that of carbon monoxide and accordingly declared acetylene a poison. Moreover, it seemed to exercise the action of a direct poison on animals.

All this happened before the production of acetylene from carbide. It happens that the acetylene was made by the incomplete combustion of coal-gas, and that in this process more or less carbon monoxide was present in the acetylene obtained. What wonder, then, that there was some degree of toxic action of the acetylene examined! It contained carbon monoxide, the poison of common illuminating gas.

**Carbide acetylene does not contain carbon monoxide.**—With the discovery of carbide and its use for the production of acetylene, all of this has been changed. It is found that carbide acetylene does not contain carbon monoxide, and that it does not have the property of fixing haemoglobin, and that it does not rob the blood of its capacity to take up oxygen from the air and carry it into the tissues. Hence the old allegation that acetylene is a poison because it deprives the blood of its oxygen-carrying capacity is no longer justified.

Another poisonous product sometimes present in the acetylene made by the combustion process was hydrocyanic acid. Never in large quantities, it yet is so toxic that we can fully appreciate its effect. It is not present in the carbide acetylene and so may be dismissed from consideration.

Another charge that is no longer justified is that acetylene is a poison because of the presence of phosphine as an impurity. This forms when carbide is made from limestone containing phosphate, the action of the coke reducing the phosphate. The selection of limestone free from phosphate has practically obviated this impurity and any poisonous action of the acetylene consequent thereto.

Indeed, the present day product may be said to avoid the pitfalls of impurities so that its effect is determined by the action of acetylene itself. We may consider then whether acetylene as such is or is not a direct poison.

**Small amounts of acetylene produce no effect.**—My present observations have been directed to the inquiry whether it produced noticeable effect on human subjects, when present in increasing amounts up to 2½% during a period of 2½ hours. To this end, four men, including myself, were enclosed in a room of about 800 cubic feet capacity and at the beginning and four times subsequently at intervals of a half hour, acetylene was liberated into the room by throwing 450 grams of carbide into an open tub of water, this corresponding to the liberation of 4 cubic feet of acetylene, each time; that is, 20 cubic feet in all, 2½% of the capacity of the room.

To eliminate, as far as possible, the mental effect of the environment, the subjects were engaged in playing a game of cards. They were interrupted only long enough to take readings of their blood pressures, at half hour intervals. The results of the experiment were quite negative. The game was continued throughout the time, excepting as noted. The blood pressure remained constant with one subject and was very slightly lowered from the inactivity with two and, of course, in the card game two men were defeated and two won, but there was absolutely no effect noted that could be ascribed to any poisonous or other action of the acetylene. It was without effect.

This same result has been obtained in experiments on animals. In such amounts as used in the above experiments there is no effect. Indeed, acetylene may be increased up to 20% and, if the mixture is so made as not to reduce the amount of oxygen, animals may be left in the atmosphere for some time, an hour or more, and will only become drowsy, from which they quickly recover when removed into ordinary air.

**Large quantities induce drowsiness.**—With very large quantities or with 20% admixtures acting for a longer time, the degree of drowsiness is increased. That is to say, the effect of acetylene in large doses is that of a narcotic, producing loss of consciousness in proportion to its degree of action. When this action is pushed to a fatal termination, the final action is upon the breathing centre, inhibiting its action and so producing death.

It thus appears that carbide acetylene is not poisonous in the sense that common illuminating gas is and that in large quantities, acting for some time, it produces a narcotic action. In respect to its toxicity, it presents no problem of adjustment under ordinary conditions. It, of course, may not replace in large degree the atmosphere we breathe, but otherwise it need not be anticipated that it produce any poisonous action.

There are a number of interesting problems presented in conneetiton with the use of the acetylene lamp as an illuminant in mines. I do not refer to those conditions where explosive gases are present and where protection from explosions is obtained through the use of the Davy lamp in some of its modifications, but to that large number of mines where this danger is not presented and which are regularly illuminated by the naked flame. For this purpose, the miner's oil lamp has been used. It is light in weight, but its illuminating capacity is strikingly low and, moreover, is obtained at the expense of a smoking out process that is amazing. It is a tribute to the miner's endurance that in the past he has accomplished so much under the conditions of poor illumination and soot-laden atmosphere which the use of the oil lamp of the past has meant. The use of the miner's acetylene lamp affords an illumination that is wonderfully efficient and entirely soot free. Its use raises some questions that we may at this time answer. Before considering these, let us look at some of the problems which the miner has to face upon which the choice of an illuminant may have some bearing. Of first importance is the composition of the air which he breathes.

**Composition of the air breathed by miners.**—For our present purpose, we may regard the atmospheric air as a mixture of 21 parts of oxygen and 79 parts of inert gas, mostly nitrogen. It is the oxygen that supports life. The proportion of oxygen may be diminished to a certain extent without noticeable effect, especially if the difference is made up by inert nitrogen. Under these conditions a reduction to 14% produces little or no physiological effect. When the reduction reaches 12%, there is apt to be slightly deeper breathing, while 10% is an amount distintly below what is physiological. Seven per cent. may be regarded as the fatal point. It is an amount too small to support the life of animal or man for any considerable time. It must be kept in mind that these figures 10% the physiological insufficiently and 7% the fatal point are for oxygen with inert nitrogen, and without the admixture of poisonous gases.

As you know, there is always present in atmospheric air a small amount of carbon dioxide gas, commonly known as carbonic acid. This amount is very small, ordinarily not over 5 parts in 10,000. It is a product formed from the combustion of organic matter and is present in air that is exhaled from the body in breathing. As we shall see later, it is also a constituent of mine gases and so is of particular interest to us. I want to call your attention to what happens when it is added to the air.

**The Physiological effects of increasing proportions of carbon dioxide.**—To answer this question I have myself made direct observations. The apparatus employed was a closed cabinet, the inside measurements of which were approximately 67 by 30 by 69 inches, having a capacity of 80 cubic feet. It was provided with a sliding door. Into the top a pipe entered and connected with three "sprays," one in each third of the top. Through this system gases were introduced. There was a small sample tube, easily moveable, so that gas was withdrawn from the location desired within the cabinet, which was connected outside with (a) an exhaust bottle for withdrawing residual air from the tube; and (b) a gas sampling tube. Collections were made over mercury and analysis were made over mercury in a Hempel apparatus. The cabinet was tightly built, but not sufficiently so to prevent escape of air sufficient to equalize the pressure without and within the cabinet when gas was introduced. A moveable electric fan within the cabinet was adapted to produce motion of the air.

When carbon dioxide was mixed with atmospheric air, it was noted that such mixture produced an increased rate of respiration, even when the proportion of carbon dioxide was small. Rabbits and guinea-pigs showed a marked increase when as much as 4 to 5% of carbon dioxide was present. With increasing proportions respirations became deep and labored, frequently, as was observed in guinea-pigs, reaching a condition of diaphragmatic spasm. Loss of muscular power developed so that, with guinea-pigs, there was loss of ability to support the body when the carbon dioxide proportion reached 20-25%. These symptoms developed irrespective of whether lamps were burnt in the same atmosphere. With rabbits, when lamps were burning, loss of muscular power appeared with the same carbon dioxide proportion as with guinea-pigs, but in the single observation made without lamps, the loss of power appeared when the carbon dioxide proportion has reached 36%. There was no effort made to determine the carbon dioxide proportions that would produce death, as it was believed that the proportion producing loss of muscular power represented the limit of possible tolerance. It may be noted, however, that in the experiment carried to a 36% carbon dioxide proportion, the rabbit quickly recovered, two guinea-pigs recovered somewhat slowly, and one guinea-pig died, when the animals were removed into fresh air. Thus it appears that even with quinea-pigs, the fatal carbon dioxide proportion is not much if any below 36%, while the carbon dioxide warning point is not above 4 to 5%.

To test the effect of carbon dioxide on man, 10½ cubic feet of carbon dioxide were passed into a cabinet, when a young man entered, the door being opened for that purpose and quickly closed. After entering, the fan was started. The rate of respiration at once rose from 18 to 48, being deeper and labored. He almost immediately complained of feeling dizzy. At the end of 2½ minutes there was a feeling of impending loss of consciousness. A sample of the air mixture was at once taken and at the end of three minutes the man came out. His respiration quickly returned to normal but his face was flushed and he complained for several hours of a slight frontal headache. Analysis of the sample showed a carbon dioxide proportion of 7%. The experiment indicated that with man the warning point is reached below a carbon dioxide proportion of 7%.

There is increase in the rate of breathing which with 3 per cent. dioxide has become so marked that it gives unquestioned warning to the subject that some unusual condition of the air is rendering it unsuited for breathing. We may call this the physiological warning point for carbon dioxide. When the concentration reaches 8 to 10%, the breathing is not only rapid, but becomes very laboured, a condition termed dyspepsia. Beyond 15%, further concentration instead of increasing respirations decreases them and the animal becomes narcotized, quite as though a substance like chloroform had been administered. At a concentration beyond 35% the narcosis becomes fatal.

I have gone into these matters of the influence on breathing, and on life of oxygen decrease and of carbon dioxide increase because these are conditions that may be presented by the air in mines. Moreover, the oil lamp has been used to indicate to the miner whether or not the mine air is fit to breathe, air that sustains the flames being regarded as safe and air that extinguishes the flame as unsafe to breathe.

The disadvantages of the oil lamp are all too apparent. Its dingy light limits the working capacity of the miner from the poor illumination. Aside from working capacity, the miner is not so well able to see the elements of danger presented by weakness in overhanging structures. An even greater disadvantage is the production of soot by the flame. This both adds to the personal discomfort already great and also to the danger of dust explosions by addition of the soot to the dust-laden atmosphere.

**Advantages of acetylene lamp.**—These conditions render an illuminant that is brilliant and soot free a very great advantage. The acetylene miner's lamp supplies such an illuminant in an admirable manner. In connection with its use it is desirable to determine the relation to composition of mine air, so that the miner may know in what way and to what extent it replaces the oil lamp as an index of safety. That is to say, we have a problem of adjustment to which it is important to give a correct and definite answer.

First, then, let us consider the variations in composition that may be presented by mine air. Because of the limitations of access of outside air and especially because of the formation of gases in mines, mine air may present a considerable departure from the composition of outside air.

All ordinary foreign gases were known to the early miners as "damps," from the German damf, meaning vapour, the specific designation being indicated by an individual prefix. Thus, the gas characterized by its tendency to extinguish the flame was called black-damp, or, since it tends to produce suffocation, choke-damp; the damp producing increased brilliancy of light, white-damp; that with a marked stink, stink-damp; that which readily took fire, fire-damp; the gas resulting from burning or explosion, after-damp, etc. The names were applied long before the composition of the respective gases was known. In consequence of indefinite basis of the classification, an individual name was in many instances applied to mixtures that presented wide variation in composition.

**Black-damp,** on chemical analysis, has ordinarily proved to be a mixture of carbon dioxide and nitrogen, the proportion of carbon dioxide varying very little up to 15% or perhaps exceptionally 20%. As it is always mixed with more or less air, a corresponding amount of oxygen is present. Other gases, such as methane (fire-damp), carbonic oxide (white-damp), hydrogen-sulphide (stink-damp), also water vapour, may be present in greater or less amount.

We may well ask, then, what the name black-damp indicates. Does it mean carbon dioxide, which is the characteristic constituent; does it mean the carbon dioxide nitrogen mixture; is it the carbon dioxide nitrogen air mixture; or is it the combination of any of these with other gases that are present in the mine air? Unfortunately, there has been no unanimity of usage in regard to this term, it having been used by different writers in almost every one of the above possible meanings.

If we were to establish anew the definition of the term, it would be doubtless wise to adopt a scientific meaning. As the matter stands, our meaning should be decided by priority, which is that black-damp is not simply carbon dioxide, but rather a mixture of that with nitrogen in varying proportions, but we must not forget the different usages of individual authors.

Our problem is: How does the admixture of black-damp modify the respirability of mine air and how is this indicated by the oil and acetylene flames? It requires no facts other than those now before us to appreciate that it affects respirability in two ways. It diminishes the proportion of oxygen which if reduced to 10%, would be unphysiological and to 7% fatal; and it increases carbon dioxide which when present to the amount of 3 to 4% would produce marked increase in the rate of breathing.

As to when the change in composition, especially the carbon dioxide increase, is indicated by the particular flames, has been the subject of personal experimental observations. The cabinet employed in the experiment with man previously described was used. In the earlier experiments with carbon dioxide, this gas was fed into the cabinet without previous admixture with air; in the later ones both air and carbon dioxide were fed into the cabinet through meters, entering the cabinet through a common tube. Thus they were well-mixed and the rate of flow of each was regulated.

Early experiments indicated that various factors ininfluenced the extinction point, both for oil and acetylene lamps. Let me relate what these factors were and how they exercised their influence.

### A. Acetylene Gas Pressure.

From the outset it was observed that the pressure under which the acetylene gas was fed through the burner exercised a marked influence upon the extinction point. That is to say, with a series of lamps in which the acetylene gas pressure varied as indicated by the character of the flame, it was not difficult in a mixture of increasing carbon dioxide proportion to foretell the order in which the lamps would be extinguished, the lamps with higher acetylene gas pressure going out first. Indeed, it was frequently observed where the escape of gas from the burner was under such slight pressure as not to give direction to the flame that the extinction point would be very much higher than was observed with the ordinary burning flame. Care was therefore exercised to make our observations on lamps in which the gas production showed a normal amount of pressure.

### B. Air Movement.

When there was no movement of air, excepting such as resulted from the convection currents produced by the lamps and by the introduction of the gas mixture, the extinction points were: for the acetylene lamps 23 to 25% carbon dioxide; for the oil lamps, 12-14% carbon dioxide. With the production of a gentle movement of the air by fanning against the side of the cabinet, the extinction points were apparently affected, being lowered in the case of acetylene lamps to from 22 to 17% carbon dioxide; in the case of oil-lamps to from 12-10% carbon dioxide.

With the production of a strong movement of the air, by direct fanning of the lamps, in two experiments, the acetylene lamps were extinguished when the air contained 9.4% and 9.9% carbon dioxide, respectively, while the oil-lamps were extinguished by the same breeze in atmospheric air.

The movement of the lamps worn on the heads of the miners would produce, in quiet air, the effects that result from a breeze with the lamps stationary. We may conclude, therefore, that in the case of the acetylene lamp the extinction point is lower than 25%, in proportion to the rapidity of motion; and with the oil-lamps, correspondingly lower than 14%.

### C. Oxygen Proportioned.

In the experiments mentioned, the oxygen was reduced only moderately by the admixture with air of the carbon dioxide in the form of pure gas. Undoubtedly, such reduction tends to lower the carbon dioxide extinction point. The effect, however, is only moderate, since the oxygen in all experiments was distinctly more than would sustain the flame if the specific effect of the carbon dioxide were neglected.

With the admixture of carbon dioxide in the form of black-damp, however, the question of the oxygen proportion becomes an important factor for consideration. In these preliminary investigations, we were not able to study the effect of black-damp, since with the use of so large a cabinet, the quantity of nitrogen required would be much greater than it was practical to obtain.

### D. Humidity.

In a number of experiments, water vapour was introduced into the gas mixture by blowing over the surface of water within the cabinet. In this way, the humidity was raised from approximately 35 to 65—80. Any effect upon flame extinction by carbon dioxide that may have resulted was within the limits of variation from the other factors considered. The conclusion is therefore reached that humidity affects the proportion of carbon dioxide, producing flame extinction only within relatively narrow limits.

Comparing now the effects of carbon dioxide increase on flame extinction and respiration, we note that the first effect is a physiological one, when the proportion reaches 3 to 4%, there being an increase in the respiratory rate that is entirely adequate to warn persons of the atmospheric conditions. Flame extinction occurs with oil at 13% and acetylene at 26% in still atmosphere, but at 10% and 17% with moderate motion. With either lamp the extinction point is too high above the physiological warning point to make it of value to the miner. The conditions will have been recognized before the extinction point is reached. Should, however, the physiological warning be unheeded, flame extinction will occur, first with the oil then with the acetylene flame, with either in ample time to prevent loss of life. The margin of safety though greater with the oil-lamp is adequate with the acetylene.

In considering the influence of oxygen decreases on flame extinction, I shall make use of observations made by Mr. Chester S. Heath, under experimental conditions different from those I have described.

He finds with the oil-flame that with moderate motion extinction occurs when the oxygen is reduced to 16.5%; in still air to 16.2%. With acetylene with moderate motion, extinction occurred at 12.6% and was dimmed in still air of the same composition, being extinguished in still air 11.5%. It thus appears that the oil-flame is extinguished with considerably less reduction of oxygen than the acetylene, but that the latter is extinguished before the reduction is fatal to man which it will be recalled was at 7%. Moreover, in actual mining conditions, where the lamp is worn on the head, there will be sufficient motion; so that extinction will occur at a point somewhere above that observed with the experimental condition.

Finally it is not to be forgotten that the condition of extreme oxygen reduction without carbon dioxide increase which was preesnt in the experimental observations is not encountered in actual mine air. The specific action of carbon dioxide admixture that will be found in such conditions will add to its effect to the oxygen decrease and bring about acetylene flame extinction that is still further removed from unphysiological atmospheric conditions and hence afford an increased margin of safety.

The miner, then, may conclude that a given admixture of black-damp and air in the absence of other foreign gases will support life: (1) If it does not extinguish flame. (2) If it does not produce markedly increased respiration. Any such atmosphere that does not give these warnings is respirable, though it does not necessarily have a composition desirable for continuous respiration. It does, however, give warning either physiological or by the flame, acetylene as well as oil, that is adequate to prevent loss of life.

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# EIGHT-HOUR SHIFT IN MICHIGAN

For some time the managers of Michigan copper mines have been planning to shorten the working hours for employees. On November 28, they announced that the change would take place on December 1. The men are now working, in accordance with this announcement, eight hours "face to face."

In the "Mining Gazette" the following explanation of the new arrangement was published on November 29:

The eight-hour day for underground employees and stamp mill men goes into effect next Monday, December 1.

An opportunity is offered miners to add to their monthly pay to the extent of nearly 10 per cent. of their present compensation.

Early in the history of the strike at the mines the mine managers stated in their report to the Governor and to the Federal Department of Labor that the inauguration of the eight-hour day for underground men had long been in contemplation and would be made effective on or before January 1. The statement was repeated in the report made by the mine managers to the committee appointed by the Copper Country Commercial Club.

Making the announcement at this time and making it effective immediately, but follows out the expectations of the mine managers early in the year.

The eight-hour shift will be in operation in all operating mines and mills at once, with the exception of the Calumet conglomerate mine, where practically all of the mining is contract work. There is some doubt as to the application of the new method in operations on the conglomerate lode and it will be tried out in one shaft in that mine of the Calumet & Hecla Company for a period of a week to determine the best way to apply the shorter shift to the working hours of the miners there.

### Eight Hours of Actual Work.

At the different mines and mills there are different conditions and different problems to work out in making the change. In general the rule will mean that eight hours of actual work will be required. Only two shifts in every 24 will be utilized. Most of the men on the day shift will start from surface at 6.45 and be back on surface at 3.45, with 30 minutes for noon meal. At some of the mines the night shift will start at 8 o'clock and at others at 8.30.

While nothing was said about the shop forces, office men and surface forces generally, in the promise of the shorter working day, with the change to the eight-hour day for underground men, the announcement also is made that the working day for such other forces will hereafter be shortened to nine hours. In the shops and on surface this change will be very generally appreciated by the men. It is explained that all these forces work day shift all the time and do not have to alternate on the night work as do the underground forces.

### Opportunity for More Pay.

The opportunity for increased pay comes to all the miners who wish to work the short shift Saturday night. For years it has been the custom in the mines of this district to pay the miners for 26 working shifts per month, when as a matter of fact they only worked 24 shifts. Ordinarily the underground men worked two weeks day shift. When on the night shift they only put in five shifts and were paid for six. This made a difference of nearly 20 per cent. additional in their pay for the night shift week. Coming twice a month it made a difference of close to 10 per cent. per month in the monthly wages. Under the new arrangement the pay will be at the top rate per day and all men who wish to put in the additional short shift, making it six shifts on the night shift week as well as on the day shift will be given the additional wages. No men will be required to work this short shift, but it is believed that most of the men will be glad of the chance to secure the added compensation because of the shortening of the regular shift to eight hours.

### Copper Range's Statement.

While the announcement of the change is to be made by the mining captains to their men to-day, the Copper Range Consolidated, through F. W. Denton, general manager, issued a circular which is applicable only to the conditions at the Copper Range mines. This circular reads as follows:

"Last winter when there was introduced in the Legislature a bill which proposed to require by law an eight-hour working day for underground employees, we, in a small way, began discussing the introduction of such a schedule, irrespective of whether the bill became a law or not. Although our consideration was by no means thorough, it became apparent at once that there was a difference of opinion on the part of the employees who would be affected as to the desirability of any change in underground hours. In general, our impression was, and is to-day, that our miners prefer the present hours because of the Saturday half-holiday and the absence of work Saturday night, but that trammers, pickers, and labourers are in favour of a change to a straight eight-hour schedule.

"It seems unreasonable and not altogether fair to have one set of hours for one class of underground labourers and another set for another class. It would appear to be better, all things considered, to have the same hours for all. However, whatever the difference of opinion there may be on this score, and there is plenty of room for it, public pressure has been sufficiently great to cause the introduction of an eight-hour schedule in the large mining districts of the country, and we believe that the time has come when we shall have to respond to the same demand, and we have promised Governor Ferris that we would arrange such a schedule by the first of January. We contemplate not waiting that long, but if no reason develops for delay, we propose to inaugurate the new schedule on December 1.

### New Schedule Explained.

"In agreeing to adopt an eight-hour schedule we defined that to mean eight hours of work. There has been some discussion in regard to the allowance of time for going to and from work, and the custom in this regard differs slightly in the different districts, as far as I have been able to learn. We propose offering a schedule which calls for an interval of eight and three-quarters hours from the time of starting from the surface to the time of starting up. Of this interval one-half hour is to be taken for lunch and fifteen minutes is taken as representing the time for going down to work.

"Our impression is that the time for starting the day shift that will meet with the most approval is 6.45 a.m., and if the first cage starts down at that time, the first trip up would start at 3.30 p.m., with 12.00 to 12.30 allowed for dinner. For the night shift, it is proposed to start down at 8.00 p.m., which would call for the first trip starting up at 4.45 a.m. It was thought that these hours for the night shift would bring men home at a suitable hour. It may be that starting at 8.15 or 8.30 would be better.

"For Saturdays it is proposed to have the same day shift as for every other day in the week, but the night shift is to start down as soon as the day shift is up, and to start to come up from the mine at 11.00 p.m., making the shift an hour or more shorter than other night shifts and putting everybody up before midnight.

"As to miners working Saturday night; this we believe will be objected to by a great many because of the aversion to working Saturday nights and also because it has been customary in this district for so many years for miners not to work Saturday nights. The company would like to have the miners work Saturday nights the same as other underground labour, both because it would give better operating results and because the present schedule is objected to by the trammers and labourers on the grounds that I have mentioned at the outset, viz.: that there should be no difference in working hours for the different classes of labour. Saturday night shift will also have the advantage of enabling a miner to earn in a month two shifts extra pay.

### Pay $3 Per Shift.

"We propose to make the miners' scale of wages on this new basis of hours $3.00 for each shift worked, and a man would be paid only for the shifts that he works. This rate is the same as is now being paid for actual time worked. On this basis, if a man worked his two Saturday nights in the month and thereby got credit for 26 shifts, he would receive, if being paid on a company account rate, $78.00. In fact, the time books will show credit only for the number of times that a man is in the mine, and the old method of giving credit for Saturday nights will be abandoned. If a miner did not work his two Saturday nights he would receive $72.00. The company proposes to be lenient and liberal in excusing men from work Saturday afternoons and nights during the summer months when there is a general desire to be excused for holiday purposes. Men so excused, however, would sacrifice pay for the shifts thus lost. We believe, however, that a sufficiently large majority of the miners would prefer to work Saturday nights to permit of profitable operations. With the constantly increasing burden which is being placed upon us by public demands, which expresses itself in compensation acts, an ever increasing load of taxes, and charges of all sorts, it is absolutely necessary for us to do everything we possibly can to increase our earnings if we would maintain our existence and keep up a profitable enterprise. It is believed that you underground employees will recognize the situation and meet this proposed schedule in a broad-minded spirit and with consideration of your fellow employees, even though in different occupations, and of the company as well as of yourselves. Although not included in our promise to the Governor, we have decided also to inaugurate an eight-hour schedule at our stamp mills. This will involve a very considerable increase in expenditure, but it did not seem fair to shorten hours of some employees and not of others, even though no demands were made for such shortening. For the shops and all other surface work, quitting time will be 5 o'clock instead of 6 o'clock, with one hour for dinner as heretofore."

## GOLD PRODUCTION OF NOVA SCOOTIA.

Gold was discovered in Nova Scotia in 1860, and mining operations then commenced. Two years after the discovery, gold valued at nearly $142,000 was recovered from the quartz veins, and since that time the annual production has, with the exception of three years, fluctuated between $200,000 and $628,000, nearly attaining the latter figure in 1902.

The total production of gold in Nova Scotia from 1862 to 1912 inclusive, was 936,499 ounces recovered from 2,117,639 tons of ore mined, this production having a value (at nearly $19.00 per ounce) of $17,793,481, equalling an average recovery of $8.40 per ton of ore crushed.

# A DEFENCE OF THE FLAME SAFETY MINE LAMP*

By E. A. Hailwood, M.I.M.E.,

(Manager to Ackroyd & Best, Ltd., Pittsburg and England).

Prior to the days of Sir Humphrey Davy, it was no doubt a natural thing to fix upon the naked flame then in common use as the probable cause of coal mine explosions.

The Davy lamp was then invented, and was thought to be a solution of the difficulties, but, unfortunately, it was afterwards shown that under certain conditions, gas when ignited inside the lamp could be blown through the gauze which surrounded the flame and an explosion created in the mine.

The Davy lamp was, however, remodelled, and the present type of bonnetted marsaut safety lamp was evolved.

It is, however, somewhat unfortunate that the tricks which could be played on the old Davy lamp have so fascinated professors and many so-called Government experts, that they have not been able to realize that the same tricks cannot be played upon the modern safety lamp. These people still devote considerable time in writing about and showing experiments on the safety lamps, and fail to draw attention to the fact that their experiments and their writings really refer to the Davy lamp and that they cannot be performed on the modern lamp.

The natural result is that an unnecessary nervousness is created in the minds of miners and coal operators who have not the time or means at their disposal of learning that these tests do not apply to the modern flame lamp, and whilst the writer agrees that experiments on the Davy lamp are instructive, he contends that it is unfair to the flame lamp manufacturers that more emphasis is not placed upon the fact that the demonstrations refer only to obsolete lamps.

One unfortunate result of these records of experiments is that at the inquiries following an explosion in a mine, many practical men or many so-called experts, get up and calmly state that in their opinion the explosion was caused by a "safety lamp."

From the writer's experience in connection with a vast number of tests on safety lamps, and from a perusal of evidence upon which these statements of experts have been based, the writer is firmly convinced that the persons giving evidence have known little or nothing about the great margin of safety possessed by modern flame safety lamps, or that the person in question has been misled by published tests on the old Davy lamp.

One of the baneful results of verdicts based on such evidence, is that instead of pursuing the inquiry further as should have been done, the actual cause of the disaster may have been overlooked, and perhaps an unnecessary change made in lamps, and yet the real means for creating a fresh disaster still retained in the mine.

Persons who have witnessed the intense heat which is necessary to cause flame to pass from the inside of a well constructed bonnetted lamp to the outside, and which can only be attained after reaching a velocity of over 3,500 ft. per minute of an explosive mixture of from 8 to 9 per cent., will realize that it is a mistake to talk of creating an explosion in a mine by the overheating of a well designed lamp. Many an explosion has been wrongly put down to this cause.

The majority of lamps now in use are fitted with bonnets or shields, and the writer has had lamps of this description in explosive mixtures and the gas inside the gauze burning for hours and the gauze red hot, and yet an outside explosion has not occurred. The writer submits that it will be a very rare occurrence to find in a mine a velocity of 3,500 ft. per minute of an explosive mixture of gas, and at the same time for the lamp to be placed in such a position as to receive the full force of this velocity, and also to have a miner stand by oblivious of the remarkable occurrence which was happening.

Such a combination of circumstances is so remote as to be unlikely to happen and may be dismissed as out of the question.

If the velocity be present, but if the enormous requisite volume of gas be absent, there is no danger. On the other hand, if gas be present, but if the requisite enormous velocity is missing it would be unlikely for an explosion to happen from the lamp. Again, it would be unlikely that the miner would remain in such gas, so that danger from "still" gas is also unlikely to occur, as the light given out from a dangerous mixture of gas burning inside a safety lamp would be so small that the miner could not under the circumstances continue working.

In another series of tests, the gas flame was kept burning in a lamp surrounded by an explosive mixture of gas. At intervals coal dust was scattered inside the lamp and also over the outside of the gauze. After the lamp had been constantly shaken about in the gas, and then coal dust allowed to remain on the crown of the gauze for some hours, the gas flame burned immediately underneath the top of the gauze and had ample opportunity to heat up and coke the coal dust.

The lamp had a single gauze only, and the test was carried out at our Pittsburg factory with natural gas, and yet the flame did not communicate with the surrounding gas, notwithstanding the fact that the gauze was often red hot. If, therefore, single gauzes will not under such conditions pass flame, it is evident that double gauzes will add an enormous extra amount of safety to a lamp.

In other tests the writer has utilized a lamp having the glass so slack that on shaking the lamp, the glass has freely rattled. The glass was split from top to bottom, and a crevice cut right across the top and also at the bottom of the split, the crevice being more than 1/32 inches wide.

This lamp was placed in a very explosive mixture of compressed gas and kept there for over one half hour with the gas blazing inside the lamp. This failed to cause an outside explosion. In the test, the gas mixture was compressed down to two-thirds its original volume, and the gas, therefore, was in a most explosive condition.

In other tests, a ready lit bonnetted lamp has been passed into an explosive mixture of gas, a hole was pierced in the top of the gauze quite ¼-inch diameter,

*A paper read at American Mining Congress, Philadelphia, Pa. (Oct. 17th to 25th, 1913).

and yet the flame failed to pass through the hole and ignite the surrounding gas. No doubt the reason for this was that the product of combustion from the lamp flame covers the hole in the top of the gauze with a barrier of incombustible gas, through which the flame could not pass to the outside gassy atmosphere. To users of flame safety lamps, this test will no doubt be interesting as it is the upper part of the gauze which is subject to the most wear and tear, and fortunately the test demonstrated that it is the top part of the gauze which is usually protected by the barrier of incombustible gas. The writer admits that if the lamp in question be allowed to be extinguished and the products of combustion allowed to escape and the lamp filled with an explosive mixture of gas, and an internal friction igniter operated so as to cause a flame to form in the lamp and ignite the gas inside the lamp, it is possible that this flame would pass through the hole in the gauze to the outside of the lamp, but this of course only refers to this particular type of lamp, and would not refer to lamps of the type which must be completely enclosed when being relit.

Some authorities have made much ado about the possibilities of the heat from the flame of the miners' lamp cracking the glass. As regards this point, it is only a question of a few dollars, as fine clear glasses can now be supplied of such quality that they may be heated up to about 340 degrees F. and sprinkled with water from a watering can, and yet the glass fails to crack.

Some people have been afraid that a fall of roof on a safety lamp may cause an explosion and ignite the gas; but the tests so far carried out by the writer seemed to prove that before the lamp is dangerously damaged the flame of the lamp is extinguished by the "crushing down force."

In one series of tests, a lamp was placed upon an iron piston, and the piston moved rapidly upwards into a cylinder containing gas, so that the top of the gauze came into violent contact with the crown of the cylinder and the gauze was crushed down. No outside explosion followed, the light in the lamp apparently being extinguished by the "crushing force" or by the concussion of the atmosphere. In the coal mine it is very unlikely that this condition of affairs would be so severe as it was in the test in question. In the event of the gas preceding the fall of the roof, the gas would most likely extinguish the lamp flame before the crush came upon the lamp. If the stone got down ahead of the gas, and crushed the lamp, the stone would crush out the light before the gas reached it. In any case there would have to be an immense volume of gas released to reach a lamp crushed on the floor.

In another test, an unbonnetted ready lit lamp was placed in a big jet of explosive gas, and the gauze smashed by a violent blow from a mallet. This also failed to ignite the gas, the blow invariably extinguishing the lamp flame.

The writer, therefore, contends that when using a well designed bonnetted lamp that fear from this "cause" may also be discounted. Whilst the writer does not, for one moment, advocate the relaxation of any possible effort to insure the supply and issue to miners of nothing but the best and safest safety lamp, he is of opinion that the tests referred to herein show that the miners' safety lamp is capable of a safety margin much greater than is generally supposed.

We now come to the consideration of the question of the detection of "gas," and the checking of the state of the atmosphere of the mine.

At a time when the prevailing craze is for more and more complication and intricacy in all appertaining to mining, the writer supposes he will be accused of sacrilege by calling a halt and asking for a hearing in defence of such a simple device for gas detecting as the flame safety lamp. It is somewhat unfortunate that the device is so simple that after, say, only a few minutes' or hours' practice in a simple gas cap observation machine, that practically any mine man can read the percentage of inflammable gas in the atmosphere. It would, no doubt, appeal more to the present generation if the lamp could be fitted with a series of levers, switches, indicating dials, and necessitate reference to elaborate tables of square root, cube root, etc. It would then, no doubt, be looked upon as a marvellously clever device and more attention would be devoted at colleges and mining schools to the elaboration of its mysterious workings.

Now, putting sarcasm on one side, the writer submits that the miners' flame safety lamp is the most simple and most accurate and most reliable device which could possibly be conceived for the practicable ascertainment of percentages of gas in the atmosphere of a coal mine.

In recent years great strides have been made in Great Britain in the organization of evening classes in all the coal mining districts. A very large proportion of both adult and young miners have attended these classes. From conversations the writer has had with many of the teachers and with men in the mines in various parts of the country and from observation of the behaviour of the mining men who visited the works with which the writer is connected, he is of opinion that this course of education will ultimately prove to be one of the biggest factors of safety introduced in recent times into the coal mines.

Up to a few years ago it was a comparatively rare thing to find miners who knew how to test for and read "gas caps." The consequence was that men have often ignorantly continued working in places so charged with gas as to be on or near the border line of explosibility, no doubt things have been done in such atmosphere which would not have been done had the miner known of its dangerous state.

It has now been established that a severe explosion can be obtained from quite a small percentage of gas if coal dust be present. The present tendency in coal mining practice is to employ vast numbers of men in each mine on each shift; to employ more electric machinery, such as coal cutters, locomotives, motors, and to push the coal face forward more rapidly and risk falls of large quantities of rock roof with the possible bringing down of gas and sparks from the grinding rock. There are also the possibilities of explosions from pipes, cigarettes, and matches. It is now, therefore, more necessary than ever to place in the hands of each miner the means whereby he may ascertain the state of the atmosphere in which he is working.

The best course to pursue will, no doubt, be to educate the miners more and more into the best methods of using the flame safety lamp and also as to how best to test for gas. It has been proposed by some parties to place a flame safety lamp at the entrance to each working place, and give it into the charge of the "gangman." This lamp will, however, generally be neglected. As the principal object of the "gangman" is to get as much coal as possible, he will, no doubt, fail to take a lamp into his working place at sufficiently frequent intervals. If each worker be provided with a flame safety lamp the chances of early detection of the presence of gas are more certain.

Some advocate the clearing of the gas out of the mine by increased ventilation. This is all right so far as it goes; but it is a difficult matter to sweep out each and every part of an extensive mine. An explosion started in one small place, may, by the aid of coal dust, carry through the mine. From time to time we read of an explosion happening in so-called model mines, where gas has either never been known, or, at any rate, has not been observed for many years. This emphasizes the need for better education of miners and the inclusion in their outfit of reliable gas detectors.

The next question is that of illumination. Many writers on this subject appear to forget that the coal miner does not go down the mine for the purpose of reading the daily newspaper. He goes down to hew coal from a generally well defined coal face and with constant practice he gets so that he could almost do the work blindfolded. Generally speaking, several men work sufficiently near each other at the face and so get a large general lighting effect from the several lamps. A miner's light may on the surface seem to be a miserable one, yet in the darkness of the coal mine this same light is quite good and sufficient for the work. Certain parties blame the flame of the safety lamp as being the cause of certain diseases of the eyes of miners, but it would now appear that there are miners who have had the benefit of the increased light from acetylene lamps and who now complain that this increased light hurts their eyes. This would seem to raise the question as to what is the proportion of miners whose eyes are naturally weak, and who would suffer pain whether the light be good or bad. The elimination of these cases will possibly show that the remainder will be quite satisfied with the existing miners' flame lamp; if not, the illumination of the flame safety lamp can now quite easily and simply be increased to 1 1/3 candle power.

## FIRE PREVENTION IN THE MINES.

Disastrous and destructive mine fires have had their origin in a majority of cases in causes of a trivial nature. Where proper safety regulations are enforced and proper equipment is at hand for fire fighting, such fires might be quickly extinguished if not prevented altogether.

The agencies for fire prevention and fire fighting should, however, be clearly separated, and the first measure necessary in connection with the former is education. Teach the miner and his children the danger of carelessness in using inflammables; point out the perils which lurk in the casual use of non-safety matches, the throwing away of cigarette butts, the careless handling of lighted candle-stumps and lamp-wicks, and the preventible fire might soon become a memory of the past. The second measure in connection with fire prevention embraces the matter of fire-proof construction, and in this connection the stable or the underground engine room should first demand attention. It is economically possible to construct stables which will be to a very large extent fire-proof, and the same thing applies to the engine room. Even where it is necessary to lay wooden floors in the stable stalls, these can be so imbedded in concrete as to be rendered practically fire-proof.

In the mine itself fire-proof materials should be used as much as possible. The shaft lining should undoubtedly be of fire-proof construction, and the use of concrete in shafts and main haulage ways opens up a large field for experimental work. Data can be adduced to show that a permanent fire-proof shaft lining is, after a period of fifteen years, cheaper than timber lining. In connection with mine timbers, also, the use of concrete and steel offers advantages over the wood, although concrete has certain disadvantages which sometimes render it unsuitable. The use of steel for this purpose, however, is gradually increasing.

Fire-proof construction in mines will undoubtedly grow rapidly in favour. The increasing strictness of workmen's compensation laws, the awakening of public sentiment, and lastly the increasing relative cost of wooden timbers as compared with steel and concrete, all point to the fact that fire prevention will, in the future, receive more attention than it has in the past.

## PLACER-GOLD FIELD IN SOUTHERN YUKON.

On November 1 the Daily Province, Vancouver, B.C., printed the following account of a new placer-gold field reported to have been found in southern Yukon:

Word of a new placer-gold strike at the foot of the Golden Horn mountain within 11 miles of Whitehorse has been brought down from the Yukon by recent arrivals in the city. It is said that gold in paying quantities has been found on two creeks and that on Discovery claim some of the miners have been panning $18 per day per man.

News of the strike has been kept quiet by those interested in the new venture, in order that the district could be well staked before those on the "outside" could hear of the new diggings. Whitehorse business men and miners living in the town are the principal holders of claims in the new camp which is declared to show promise of proving rich. The discovery was made on October 7.

The district is easily accessible, being about two miles from Wigan on the line of the White Pass & Yukon route. The Town of Whitehorse has received a big impetus by reason of the new strike.

There has been no concerted rush to the new Wigan diggings on account of the lateness of the season, and the fact that the discovery was kept dark, and no big excitement outside Whitehorse is being manifested, according to advices from the north.

Most of the pay is said to have been found near the surface, none of the shafts having been sunk down to bed rock so far.

Mr. Isaac Taylor, of the merchandise firm of Taylor, Drury & Taylor, of Whitehorse, informed the Province when asked for confirmation of the reports as to the new placer strike, that from the advices he had received from his business associates the prospects in the new camp were most encouraging. He said he had been told that even if gold was not found in large quantities the conditions were particularly favourable for hydraulic mining as the claims could be easily worked and there was sufficient water available in the adjoining creeks for ten sets of sluice boxes. The surface indications were promising and he understood that the pay found so far averaged from $8 to $12 a day per man.

In view of the lateness of the season Mr. Taylor expressed the opinion that little development would be carried on until next spring.

# THF METAL COBALT AND ITS ALLOYS*

By H. T. Kalmus.

The mining companies receive very little return for the cobalt content of the silver ores of the Cobalt district. There have been about 175,000 tons of silver bearing ore shipped from the Cobalt district since 1904, carrying approximately 7,000 tons of cobalt, which at a reasonable market value for metallic cobalt, should have been worth in the neighbourhood of $10,000,000. For this the mine owners received only $566,000. Much of this cobalt is lying as residues, etc., at the smelters, for practically the only market which it finds is a limited one for the use as blue colouring substance. For this purpose the smelters ship black cobalt oxide, which consumes about one-third of the present output of the camp, leaving to be cared for, the remaining two-thirds and the surplus from other years. Thus there is a potential value of many millions of dollars in the cobalt metal of Ontario which is not being realized.

Waste products running high in cobalt may be obtained in a variety of forms from the smelters, but inasmuch as the process for the production of fairly pure cobalt oxide has been very completely worked out and is being practised on a large scale by the Canadian Copper Company,† Copper Cliff, Ont., the Deloro Mining and Reduction Company, Deloro, Ont., the Coniagas Reduction Company, Thorold, Ont., and the Canada Refining and Smelting Company, Ltd.,‡ Orillia, Ont., it seemed advisable to use this oxide as an initial substance.

### Purification of Cobalt Oxide.

In much of the work to follow it is important that the influence of the metal cobalt be sharply differentiated from that of iron and nickel which are the principal metallic impurities of the original oxide. Also before undertaking the investigation of a large series of alloys of cobalt, it is important that the properties of the pure metal itself be established. For these reasons a purification of a certain amount of the oxide was undertaken. The method employed was in principle that in standard practice in the Canadian cobalt oxide plants, but the author wishes to express his indebtedness to Prof. S. F. Kirkpatrick, of the School of Mining, Kingston, for many important details.

The iron was removed from a solution of the oxide in hydrochloric acid by precipitation with marble, and a separation of the nickel was brought about by use of the differential precipitation of the hydrates of nickel and cobalt by means of a bleach soluton, and finally the sulphur was removed with sodium carbonate and hydrochloric acid.

The original oxide analyzed:

| | Per cent. |
|---|---|
| Cobalt | 70.36 |
| Nickel | 1.12 |
| Iron | 0.82 |
| Sulphur | 0.45 |

The oxide purified by this method (June, 1912), analyzed:

| | Per cent. |
|---|---|
| Cobalt | 71.99 |
| Nickel | 0.04 |
| Iron | 0.11 |
| Sulphur | 0.02 |

### Preparation of Metallic Cobalt by Direct Reduction of Oxide.

From the fairly pure cobalt oxide ($Co_2O_3$) there are several possible methods of obtaining metallic cobalt in a reasonably pure form.

(1) By reduction with hydrogen gas.
(2) By reduction with carbon monoxide gas.
(3) By reduction with aluminum.
(4) By reduction with carbon.

With the present commercial possibilities for the production of water gas, of producer gas, and, indeed, of pure hydrogen as practised by the General Electric Co., of Schenectady, N.Y., for the reduction of metallic oxides, any of these four methods might ultimately be used on a large commercial scale. Hence, an investigation of the chemical equilibria involved in these reactions has been and is being made.

### Reduction of Cobalt Oxide by Hydrogen Gas.

One set of experiments has been completed and another set is under way to determine the rate of the reaction $Co_2O_3 + 3H_2 = 2CO + 3H_2O$, in the presence of an excess of hydrogen, and at various temperatures from 500° C. to 1,100° C.

**Electric Furnace or Reaction Chamber.**—The furnace employed had a horizontal tube heating chamber 2½ inches in diameter by 15 inches in length. It operated at 25 volts and absorbed up to 12 KW. The resistor was a series of concentric carbon rings which could be pressed more or less tightly together by means of suitable adjusting screws. By this means the temperature could be controlled at will to be anything from 500° C. to 1,500° C.

**Charge and Run.**—Alundum boats were charged with a shallow layer of cobalt oxide ($Co_2O_3$), both boat and oxide having been dried to constant weight. This charge was kept within the heating chamber for various lengths of time at various temperatures in an excess of hydrogen. At the end of a definite measured time the boats were cooled and reweighed to ascertain the amount of reduction.

All the observations were made in duplicate with two boats in parallel, and concordant results were for the most part obtained. A series of observations was made, of about 20 weighings each, at the following temperatures, 585° C., 724° C., 825° C., 964° C., 1,065° C.

**Preliminary Conclusions.**—The reduction at the lower temperatures takes place much more slowly than at the higher temperatures, and at each temperature, after a short time, the rate of reduction becomes so slow that the reaction could not economically be carried further. For example, at 585° C. at the end of 15 minutes the reduction is 28 per cent.§ complete, whereas at the end of an hour it has only increased to 30 per cent.§ complete. As against this, at the higher temperature 1,065° C. at the end of 7 minutes the oxide is 89 per cent.§ reduced, and shows less than 1 per cent. further reduction during the next half hour.

Obviously from such complete data it will be possible to determine, for any given type of furnace and with a definite cost of power, what would be the most

*Extract from preliminary report of investigations at the Research Laboratory of Applied Electro-Chemistry and Metallurgy, School of Mining, Queen's University, Kingston, Ont., for the Mines Branch, Department of Mines, Canada.

†Cobalt plant recently closed down.

‡Main buildings destroyed by fire, January, 1913.

§These percentages are based upon cobalt oxide analyzing 71.99 per cent. Co which was used, and which is somewhat higher in Co than $Co_2O_3$.

economical temperature of operation for this reduction, balancing the cost of maintaining the higher temperatures against the increased rate of the reaction at those higher temperatures.

### Reduction of Cobalt Oxide by Carbon Monoxide Gas.

In a manner similar to that of the reduction of cobalt oxide ($Co_2O_3$) by hydrogen, the reduction with carbon monoxide (CO) gas at various temperatures was studied.

**Electric Furnace or Reaction Chamber.**—This furnace was identically that used for the reduction of cobalt oxide ($Co_2O_3$) by hydrogen and has been described above.

**Charge and Temperature Measurements.**—Alundum boats were charged with a shallow layer of cobalt oxide, and placed within the reaction chamber, and temperature measurements were made with a platinum, platinum-rhodium thermo-element, both just as described above under hydrogen reduction.

**Removal of Boats for Weighing.**—After allowing the reaction $Co_2O_3 + 3Co = 2Co + 3CO_2$ to proceed for a measured length of time, boats run in parallel were removed, cooled, and weighed to determine the amount of reduction. In this case, apparently contrary to that of the hydrogen reduction, there was a considerable amount of reoxidation during cooling, so that it was necessary to cool the boats in an atmosphere of carbon monoxide (CO). A special container was devised to allow the charges to be removed from the furnace and cooled, remaining throughout in a carbon monoxide atmosphere.

**Preliminary Conclusions.**—The runs with carbon monoxide are still in progress, but a sufficient number have been made to denote that the curves showing the rate of reaction at different temperatures are similar to those for hydrogen, but that carbon monoxide (CO) is a much more vigorous reducing agent. We find, for instance, that at the low temperature 585° C., reduction is nearly 90 per cent. complete at the end of 15 minutes with CO, whereas at the same temperature with $H_2$ at the end of 15 minutes the reduction was less than 30 per cent. complete.

### Reduction of Cobalt Oxide by Carbon.

The theoretical amount of powdered carbon, charcoal, or coke to reduce a charge of approximately 5 pounds of cobalt oxide was intimately mixed with it, and heated in an oil crucible furnace or in an electric crucible furnace.

In this way it was found possible to obtain a yield of metallic cobalt in the neighbourhood of 95 per cent., and in many cases between 99 per cent. and 100 per cent. At a temperature of 1,200° C., a run of about one hour serves to bring about complete reduction, while at a temperature of 900° C., 2½ hours are not sufficient.

Analysis shows that the metal obtained by carbon reduction is fairly free from carbon, running in the neighbourhood of a few tenths of one per cent. Moreover, by adding a small quantity of lime to these melts at the temperature of the electric furnace, the carbon may be almost completely removed. Some of the analyses for carbon before adding lime are given with the yields.

This method of preparation of metallic cobalt by direct reduction with carbon could be practised industrially at very low cost. We are able, in electric furnaces not especially designed for this work, to reduce enough oxide to make 15 pounds of metal in about 1 hour, absorbing 20 KW. Thus on a commercial basis the power charge for this reduction would be small.

### Properties of Metal Cobalt.

The properties of the metal cobalt and of its alloys have been and are being studied under the following headings:

Melting points;
Casting properties;
Turning, rolling, and forging properties;
Hardness;
Tensile strength;
Compressive strength;
Corrosion in acids and atmosphere;
Structure as determined by micro-photographs;
Magnetic properties;
Thermo-electric power;
Electro-motive force as electrode of voltaic cell;
Plating properties.

**Melting Point of Metallic Cobalt.**—A long series of melting point determinations was made in a General Electric Co. Arsem. Electric Vacuum Furnace, using pure alumina crucibles and a charge of about 50 grammes of metallic cobalt. The mean of a set of 6 measurements, the average deviation of the single observations from the mean being 1.8°, gives the melting point of pure cobalt to be 1,497° C.

**Casting Properties of Metallic Cobalt.**—Cobalt when prepared in a fairly pure state by reduction from the oxide with hydrogen, with carbon monoxide, or with carbon, was poured to make various sizes and shapes of castings, both in sand moulds and in iron moulds. Cobalt, similar to iron, shows a marked tendency to occlude gases in casting. We obtain perfectly sound castings by degasifying with manganese and by soaking, that is by holding the melt for about one hour at a temperature not very far above its melting point.

**Turning, Rolling, and Forging Properties of the Metal Cobalt.**—Castings of cobalt in the neighbourhood of 99.5 per cent. pure may be readily turned with the ordinary lathe tools. It is a beautiful metal resembling nickel, but tougher and more lustrous. Observations of the rolling and forging properties are being made.

**Hardness of the Metal Cobalt. Testing Machine.**—The hardness of this metal and of its alloys was tested on a Standard Olsen Hardness Testing Machine of 10,000 pounds capacity (Tinius Olsen and Co., Philadelphia, Pa.).

About 25 Brinell hardness measurements have been made with fairly pure cobalt, which vary among themselves depending upon the method of casting and upon the heat treatment of the sample. Some attempt is being made to differentiate the hardness of cobalt cast in sand moulds, in iron moulds, and to give some figures showing the effect of annealing and quenching. These data will be given in the subsequent complete publication, but for the present we may give as the mean of a number of determinations the following values:

| | |
|---|---|
| Brinell hardness, metallic cobalt, chilled from melting point | 90.8 |
| Brinell hardness, metallic cobalt, annealed from 250° C. | 77.3 |

These figures, while not final, serve to show that cast cobalt has about the hardness of wrought iron.

(To be Continued.)

# PERSONAL AND GENERAL

Mr. Phil H. Moore, lately mining engineer and manager for the mining, crushing and cement department, Canadian Allis-Chalmers, Ltd., has accepted the position of general manager of Rock & Power Machinery, Limited, head office Toronto.

Mr. J. B. Tyrrell, who has been for several weeks in England, expects to sail from Liverpool for Canada on December 13th.

Mr. H. P. Watson attended the Toronto branch meeting of the Canadian Mining Institute, November 29th, and outlined what had been done by the Mine Owners' Association in reference to the proposed Workmen's Compensation Act.

Mr. C. L. Randolph has opened an office at 150 West 57th Street, New York.

Mr. R. E. Hore has returned to Toronto after visiting mines at Cobalt and Porcupine.

Mr. C. A. Foster has sailed from England for Canada.

A meeting of the Council of the Canadian Mining Institute was held in Montreal Saturday, December 13.

A meeting of the Executive Committee of the International Geological Congress was held in Montreal, Saturday, December 13.

Mr. W. E. H. Carter is in Toronto.

Mr. A. A. Hassan left New York on December 8 to examine placer gold deposits in Arizona. His address will be Kingman, Arizona.

The Rock & Power Machinery Co. has opened offices in the Royal Bank building, Toronto. Branch offices will be at Halifax, Montreal, Sudbury, Cobalt, Winnipeg, Calgary, and Vancouver.

On Friday evening, December 5, 500 engineers attended the twenty-fifth annual dinner of the University of Toronto Engineering Society, held in the big drafting room of the 'School.' Graduates from all parts of the country gathered to do honour to Dr. John Galbraith, Dean of the Faculty of Applied Science of the University of Toronto, and to celebrate the fiftieth anniversary of his entrance at the University and the thirty-fifth anniversary of his founding of the School of Practical Science.

At a meeting held in Cobalt on November 29th, a Northern Ontario club of Michigan College of Mines alumni was formed. A banquet will be held at Haileybury on January 3rd to inaugurate the permanent organization.

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club on November 29th. The report of the Commission, appointed by the Province of Ontario, on Workmen's Compensation, was discussed.

Mr. Ralph Scott, mine engineer at the Dome mine, Porcupine, and Miss Myrtle Harris, of Calumet, Mich., were married in Calumet on October 29th.

Mr. A. D. Acland, of Ottawa, Deputy Minister of Labour, has been at Nanaimo, Vancouver island, B.C., endeavouring to bring about a settlement of the labour dispute at coal mines in that district.

Mr. M. W. Bacon, of Butte, Montana, manager for the Stewart Mining Co., operating in Coeur d'Alene district, Idaho, has lately been to a group of mineral claims situated in the northern part of Vancouver island, B.C., which property is being developed, under option of purchase, by United States mining men. There is stated to be a large showing of copper ore on the claims, and much prospecting work is to be done under the bond.

Mr. Chas. A. Banks, manager for the Jewel-Denero Gold Mines, Ltd., operating the Jewel mine and 15-stamp mill near Greenwood, Boundary district has returned to British Columbia after having examined a graphite property in the Province of Quebec and gone thence to New York City. During his absence Mr. H. D. Quimby, who recently arrived from the United States, was in charge at the Jewel, at which both mine and mill have been worked steadily since the beginning of last July.

Mr. P. M. Collins, formerly of Butte, Montana is mill superintendent for the British Columbia Copper Co. at Boundary Falls, B.C, where the first unit of a concentrating plant is being put in with which to treat ore from the company's Lone Star and Washington mines.

Dr. Chas. W. Drysdale, of the Geological Survey of Canada, who had been for six months engaged in continuing the structural survey of Rossland camp on which R. W. Brock spent much time several years ago, left Rossland for Ottawa on December 1st. He was accompanied by Dr. B. Rose, also of the Survey, who for two or three months had been assisting him.

Mr. A. W. Davis, of the Consolidated Mining and Smelting Co.'s mining engineering staff, is in charge at the company's Sullivan Group mines, in East Kootenay, B.C., during the absence of the superintendent, Mr. C. H. McDougall, who for the last two months has been in Montreal, receiving surgical treatment for a bad knee which has incapacitated him from carrying out his ordinary duties.

Mr. S. S. Fowler, general manager for the New Canadian Metal Co., operating the Bluebell lead mine and concentrating mill at Riondel, Kootenay lake, B.C., is mourning the death of his mother, who died recently at Boston, at an advanced age.

Mr. J. D. Galloway, acting assistant to the Provincial Mineralogist for British Columbia, has returned to Victoria from a trip to mining camps in Similkameen and Boundary districts of that province.

Mr. A. H. Gracey, who is working the Venus gold mine under option of purchase, has returned to Nelson, B.C., after a short stay in Spokane, Washington.

Mr. Ronald Harris, of London, Ontario, has returned to Canada after having spent the summer in Alaska, where he was engaged in supervising the development of a gold mine.

Mr. Arthur Hickling, of London, England, managing director of the Princeton Coal and Land Co., owning a coal mine and much other property in British Columbia, has been at Princeton, Similkameen, where the company's chief activities are carried on.

Mr. Douglas C. Livingston, who, after graduating at McGill University some years ago went to Mexico and later joined the mining engineering department of the University of Idaho, Moscow, Idaho, has lost his little son, whose death occurred last month.

Mr. Anthony J. McMillan, liquidator of the Le Roi Mining Co., formerly operating in Rossland camp, British Columbia, was recently hurriedly recalled to England, owing to the serious illness of his only son and child. Mr. McMillan had been in the East a short time, investigating the affairs of the Londonderry Iron Co., of Nova Scotia, for which corporation he was recently appointed receiver.

Mr. E. G. Montgomery, assistant superintendent of the Consolidated Mining and Smelting Co.'s Centre

Star group of mines, left Rossland, B.C., on December 1st, on a six weeks' vacation trip to Montreal and lower Quebec.

Mr. J. W. D. Moodie, vice-president and general manager of the Britannia Mining and Smelting Co., Howe sound, B.C., was in New York City recently.

Mr. A. C. Seaton, formerly with the Nicola Valley Coal and Coke Co., has been appointed assistant superintendent at the Corbin Coal and Coke Co.'s colliery in Southeast Kootenay, B.C.

Mr. Chas. H. Stewart, of Messrs. Alex. Hill & Stewart, mining engineers, London, England, was expected to reach Rossland, B.C., about December 4th on a visit of inspection to the mines of the Le Roi No. 2, Ltd., for which company and the Van-Roi Mining Co., operating near Silverton, Slocan, his firm has for years been managing engineers.

Mr. R. H. Stewart, general manager for the Consolidated Mining and Smelting Company of Canada Ltd., has gone on a visit to Los Angeles, California. He will shortly proceed to Toronto to attend the annual meeting of shareholders in the Consolidated Co.

Mr. R. P. Trimble, formerly of Portland, Oregon, who for a year or two has been actively interested in arranging for the development of mineral claims in the Rocher Deboule Mountain section of the Skeena district, B.C., is at the head of a movement to prevent a Butte, Montana, syndicate from taking possession of and working a mining property on the mountain under terms and conditions that it is claimed are unfair to minority shareholders and damaging to their interests.

Mr. Frederick R Weekes has returned to New York City after having been for more than a year resident engineer at the Copper Mountain mining properties, Similkameen, B.C., which the British Columbia Co. and allied interests have been developing under option of purchase. He continues as supervising engineer, in which capacity he will visit Copper Mountain camp periodically.

Dr. Wesbrook, president of the newly-organized University of British Columbia, has arranged to deliver an address before the Vancouver, B.C., Chamber of Mines, which has a largely non-technical membership, on a subject bearing upon the relation of the university's activities to the mining industry.

Mr. George H. Aylard, general manager for the Standard Silver-Lead Mining Co., which since April, 1912, has paid $50,000 a month in dividends to its shareholders, and is reported to now have much more ore in sight in its mine near Silverton, B.C., than when it was acquired by the company nearly three years ago, spent the month of November with his family at their home in Victoria.

Mr. J. C. Edwards, superintendent of the Treasure Mountain Silver-Lead Mining Co., which is opening a mine in the district known as Summit camp, situated near the headwaters of Tulameen river, B.C., has lately been in Spokane, Washington, consulting with the directors of the company relative to continuing development work at the mine throughout the winter.

Mr. W. J. Elmendorf, general manager for the Portland Canal Tunnels, Ltd., which during the last year has been driving a long crosscut adit on a group of claims in Portland Canal mining division, British Columbia, recently made a business trip to Tacoma, Puget Sound, Washington.

## COAL MINING IN SOUTH-WESTERN ALBERTA

The following information concerning coal mining companies operating in southwestern Alberta has been published in Spokane, Washington:

**International Coal and Coke Co.**—It is stated that the output of the International Coal and Coke Co.'s mines in October was 38,800 tons of coal and 6,000 tons of coke, practically all of which was shipped immediately. The bulk of the coal shipments were consigned to places in northern part of Washington, and the coke is being taken by British Columbia mining companies for use in their smelters.

The properties, situated near Coleman, Alberta, are producing from 250 to 300 tons of high-grade coal daily, in addition to coke material. The report states that the coke orders have increased in the last 30 days from 250 to 450 tons daily, and the capacity of the coke ovens is being taxed to fill the orders. Extensive additions to the plant are under consideration, and as soon as a sufficient fund is in reserve construction will be commenced. The mines operated 26 full days during October, employing 525 men, 35 less than in the preceding month, the approach of winter having necessitated curtailment of the force.

The Canadian Pacific Railway Co. is taking the surplus output of the mines and is furnishing all the cars.

**McGillivray Creek Coal and Coke Co.**—The McGillivray Creek Coal and Coke Co., which operates mines at Carbondale, in Crowsnest district, a large portion of the output coming to Spokane, shipped more than 14,000 tons of commercial coal in September, according to a report which reached Spokane stockholders lately. This is the largest monthly production in the history of the company. The report says also that there is blocked out in the mine now, ready for immediate extraction, 400,000 tons, and that the shipments for October undoubtedly will exceed the September mark, lack of cars having curtailed consignments.

The McGillivray Creek Co., whose holdings adjoin those of the International Coal and Coke Co., has made a remarkable record during the comparatively short time the collieries have been operated. The cost of development of the mines and the installation of machinery and equipment, representing an expenditure in excess of $300,000, has been paid for out of the property's earnings and the officials of the corporation state that they expect to be able to start a surplus fund soon.

### MORE DISCOVERIES AT CHISANA.

At the end of October the Dawson News said: "Lem Gates arrived at the mouth of White river after mushing alone from Discovery, Chisana, in twelve days over a bad trail. He reports strikes on four new creeks and all are claimed to be rich. The prospectors on the benches off Bonanza and Elorado creeks are said to have uncovered pay that will go as high in places as an ounce per hour to the man. Many have claimed these benches are the hope of the camp. Pay has also been found on Frying Pan creek on the Canadian side. There are at least 400 cabins at the mouth of Johnson creek, and about the same number at the mouth of Snag. Practically the whole of the population of Donjek has moved to Snag. It was reported at Johnson creek that the Copper River & Northwestern Railway people were within ten miles of the diggings with a trail, and it was said that the packing rate to the diggings will be fifteen cents per pound when the trail shall be completed."

# SPECIAL CORRESPONDENCE

## COBALT, ELK LAKE, AND SOUTH LORRAIN

**Plans to Drain Cobalt Lake.**—There now appears no opposition to the draining of Cobalt lake. The town of Cobalt has never been actively against the scheme since it was assured that the health of the municipality would be safeguarded. All pretentions to beauty, which the lake ever had, have long ago disappeared under the tailings from the many mills. The principal opposition came when the plan was first mooted, from the township of Coleman, under whose jurisdiction the lake is. Their opposition was based mainly upon the idea of loss of revenue, the town agreeing to the scheme of draining the lake if the Cobalt Lake Co. were brought into the town. This the township strenuously opposed. Friends of both parties have been quietly working all the fall to bring them to an agreement and the directors of Cobalt Lake Co. met representatives of the township of Coleman in the last week in November. At this conference an agreement was reached whereby the township receives a certain consideration for permitting the Cobalt Lake Co. to be brought into the town. There then remained the rights of the mines round Cobalt Lake to be safeguarded. Those chiefly interested were the Nipissing, the La Rose, the Chambers-Ferland, and the McKinley-Darragh. Representatives of these mines met the solicitor and manager of the Cobalt Lake Mining Company in Cobalt the first week in December, and an agreement has finally been reached. The Cobalt Lake Mining Company engaged to supply all the mines and mills on the lake with water, and on this basis all opposition was withdrawn. Official application to drain the lake will come before the Mining Commissioner in Toronto the middle of this month. As the opposition has, in the main, been placated there is no reason to suppose that it will be any more than a formal sitting.

**The eight-hour day for underground miners** will come into force automatically in Northern Ontario without the slightest hitch. The majority of the mining companies in Northern Ontario opposed the eight-hour day strenuously, but once it was passed they resolved to abide by it without protest. All through the North preparation is now being made for the change. In Cobalt notices have been posted at nearly all the mines, stating the new hours for miners. According to these notices the working hours will be from 7 to 12, and from 1.15 to 4.15.

These hours will, of course, be from "face to face." It has also been officially announced by the mine managers' organization, to which four-fifths of the companies in the camp belong, that there will be no cut in wages when the eight-hour day goes into operation. The decision not to cut wages was arrived at early in the year, but no official pronouncement was made until the last week of November. All but a very few of the working mines have subscribed to it.

There is, therefore, every reason to suppose that the new law will go into operation automatically and smoothly on the first day of the new year. Representatives of the companies have been in other camps in Northern Ontario observing the working of the eight-hour day shift.

**Workmen's Compensation.**—The issuance of the final draft of the Workmen's Compensation Act is not likely to meet with any strenuous opposition in Northern Ontario. When Sir William Meredith visited Cobalt two years ago to obtain the opinion of the men and the employers here, he found practically no opposition to the principle that the employer should be liable for the injuries of his employees, and, in the main, there was assent to the principle that the burden of proof should lie on the employer to show that there had been wilful negligence.

The mining companies are almost ready to exchange any state of affairs for the wearisome and interminable litigation which now follows the injury of a workman. The numerous cases have always aroused an antagonism between the miners and the companies which could be entirely done away with under a well drafted Compensation Act.

**Motor Car Service and Government Telephone for Gowganda.**—The announcement of a motor car service and a government telephone line between Elk lake and Gowganda has been variously received. It is recognized on all hands, however, that to make the motor car service of any utility to the Montreal River camps, the road between Elk lake and Gowganda must be improved. There are but a few months in the summer—in a dry summer—when a motor car could be run with any regularity There is now no competition in the stage service and the traveller does not get into Gowganda in less than one day. In the winter when the roads are dry and when the sleighing is good, the time can be cut down very materially.

**Drummond Fraction.**—Work has commenced on the Drummond Fraction, the seven and three-quarter acres of lake bottom bought from the Caribou-Cobalt by the Kerr Lake and Crown Reserve. The Wright shaft of the Caribou-Cobalt has been leased and the shaft-house has been repaired and a rock house added. Before the Drummond mine was sold a drift had been run for 75 or 80 ft. on a vein of high-grade ore, so that production will commence almost at once.

The draining of Kerr lake has also exposed a promising vein on the surface. The Drummond Fraction is being worked as a separate unit by the two companies jointly.

**New Northern Customs Concentrator.**—One-half of the 80-stamp battery of the Northern Customs concentrator will be dropping on ore before December 15th, while the remaining forty will be ready about a month later. The mill has been rushed up in record time. It was during the first week in September that the first ground was broken for the foundations. A full month ago the building was housed in and awaiting the machinery. Thus only three and a half months have elapsed from the removing of the soil on the hillside at 104 to the dropping of stamps. The system of concentration to be used is identical in all essentials to that built by Mr. Bourne on the Cobalt Townsite property. The first forty stamps to be operated will drop on La Rose ore. This contract for 200 tons a day is now being filled at the old Northern Customs mill, but will be transferred to the concentrator at 104 as soon as the company is ready for it. Thirty of the other stamps will be reserved for the Chambers-Ferland, a contract having been signed recently between the two companies. This contract comes into force next May, and gives the Chambers-Ferland the privilege of using 30 stamps for five years.

The 5-Stamp Mill at Tough-Oake's Mine, Kirkland Lake, Ont.

Tough-Oake's Mine in July, 1913

**McKinley-Darragh-Savage.**—The production of the McKinley-Darragh-Savage mine for the month of October amounted to 192,749 ounces, comparing with 242,266 ounces in the previous month. Of the total 60,017 ounces came from the Savage. From No. 40 vein alone 43,000 ounces were mined during the month. On the Savage an entirely new vein has been discovered and 64 ft. of it was opened up before values became lean in the face.

**Caribou-Cobalt.**—During the month of November the Caribou-Cobalt made in profits between $17,000 and $18,000. There were mined and sent to the Dominion Reduction Company for treatment 1,500 tons of 36.6 ozs. ore. In addition to the low grade the high grade sorted and bagged amounted to between 12,000 and 14,000 ounces.

**Hudson Bay.**—The total production of the Hudson Bay mine for the month of October was 38,306 ounces. The concentrator crushed 1,742 tons of ore, the average assay of heads to mill was 23.4 and the percentage of extraction was 86.

**Downey.**—From the Downey claim just east of Silver lake in the Elk lake section there will be shipped about 11 tons of high grade ore this winter as soon as the road is good. This ore has been known to be in place for years, but till within a short time ago the claim was in litigation. The vein has now been open cut for a distance of about 30 ft. long by 15 ft. deep, and 250 sacks of high grade taken therefrom. This ore will run between two and three thousand ounces to the ton. Larry Downey, who is working the claim, is now sinking a shaft to endeavor to pick up the vein at the 50-ft level.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Tough-Oakes.**—Cables from Mr. C. A. Foster in England confirm the report of the sale of the Tough-Oakes, the Burnside, the Robbins, the Wright, and other claims in the Kirkland lake area to a powerful English syndicate. It is reported that a company will be formed at once embracing all these claims with the Tough-Oakes as a nucleus.

Mr. Foster sailed from England at the beginning of the month, until he arrives full details of the deal will not be known, but it will certainly mean the interesting of a large amount of British money in Northern Ontario. The Tough-Oakes mine is being worked at the 100 and 200-ft. level. About 13 tons of $30 ore is being treated in the little mill every day, while the high grade from the vein is handpicked and sacked.

**Hollinger.**—The gross profits from the operations at the Hollinger mine for the four weeks ending November 4th were $124,495, as compared with $131,510 during the previous four weeks. The average value of all

Sinking Shaft on Gold Quartz Vein at Burnside Mine, Kirkland Lake, Ont.

ore treated amounted to $15.40, against $17.39 for the previous four weeks. Mr. P A. Robbins, general manager, states in his report the mill ran 95 per cent. of the possible running time, treating 13,401 tons, of which 310 were treated for the Acme Gold Mines. The approximate extraction 91.1 per cent., milling costs $1,407 per ton. The total cost of $5.5 per ton shows a reduction from previous results. Mr Robbins points out that this cost per ton includes everything. The actual cost for mining, milling and general charges amounted to about $4.25 per ton. Satisfactory development has continued in the mine, drilling amounting to 1,284 ft. The winze below the 425-ft. level had reached a depth of 22 ft. on November 4th. The vein is 8 ft. wide and carries $17.20 per ton at the bottom of the winze. The profits to-day minus dividends amount to $757,574.

Shaft House and Mill, Hollinger Gold Mine, Porcupine, Ont.

**Dome Lake.**—The Timiskaming and Hudson Bay Mining Company has purchased full control of the Dome Lake mine at Porcupine from the General Assets Company of Montreal and the shareholders. At a special meeting, the Dome Lake shareholders agreed to sell 250,000 shares, all of the treasury stock remaining at seventeen and a half cents per share. The General Assets, Limited, had previously sold 200,000 shares to the same Cobalt company, at the same figure, so that the latter have now 400,000 shares. The total outlay of the purchasers is $70,875. The new management lost no time in electing their new board. This board is Messrs. George Taylor, president; Angus McKelvie, vice-president; T. McCamus and C. L. Sherrill, directors. The president declares that after valuation of the property has been made, development will at once be resumed.

**McIntyre.**—Official figures from the McIntyre mines show that while ore ran $9.57 ton, the ton costs amounted to $6,133. Total production, $41,098. Detailed figures are, ore milled 4,131 tons at $9.57 per ton. The total amount of bullion shipped and on hand is $39,242. The running time was 720 hours, or 96.77 per cent. of the possible running time.

**The North Thompson claim** has been taken over by the Associated Gold Mines of East Australia. This is the same company that has the option on the Keeley in South Lorrain. The Elrich-Hamilton interests are world-wide operators. The option on the North Thompson was held by Baron Von Polenz. The new company is to be capitalized at $1,000,000 at par.

## BRITISH COLUMBIA

Production is being continued at all the larger lode mines of the Province, and the total quantity of ore produced is steadily increasing. The chief producing mining divisions or districts are Fort Steele, in East Kootenay; Ainsworth, Slocan, Nelson and Rossland, in West Kootenay; Greenwood and Hedley, in Boundary-Similkameen; and Britannia mountain, on the Coast. The larger mines are the Sullivan, East Kootenay; Bluebell, Ainsworth; Standard, Slocan; Silver King, Nelson; Le Roi, Centre Star-War Eagle group, and Josie, Rossland; Granby, Rawhide, and Mother Lode, Boundary; Nickel Plate, Hedley; and Britannia, on the Coast.

### EAST KOOTENAY.

**Fort Steele Division.**—About one hundred men are employed at the Sullivan Group mines. Much development work is being done, and production of lead ore is being steadily maintained, the output in 1913, to the end of November, being approximately 32,000 tons. The lead ore is sorted out and shipped to Trail, while the zinc-lead ore is stored to await the provision of suitable facilities for separation of the ore metals.

From 20 to 25 men are regularly employed at the St. Eugene mine, at which a small amount of development work is being done and lead-silver ore is shipped, though in much smaller quantity than in earlier years. The ore is shipped crude, as the mill is not now being operated. There is believed to be a fair prospect of finding another large shoot of ore in this mine, but at present the quantity of ore available for mining and shipment is small.

### WEST KOOTENAY.

**Ainsworth.**—The total quantity of ore from Ainsworth mines received at the smelting works at Trail during four weeks ended October 30 was 2,041 tons. Of this, 798 tons was chiefly lead concentrate from the New Canadian Metal Co.'s Bluebell mine, situated on the eastern shore of Kootenay lake, opposite the town of Ainsworth; 85 tons from Retallack & Co.'s mines near Whitewater; and 79 tons from the Utica mine, on Paddy's mountain. The shipments from Ainsworth camp proper—that is from mines in the vicinity of the town of Ainsworth—were as follows: From the Highland mine, 455 tons; No. 1 mine, 425 tons; Silver Hoard mine 199 tons. Other properties being operated were the Gallagher, near Ainsworth; Florence Mining Co.'s properties, on Princess creek; Sun, on Woodberry creek; Eagle Lode Co's Eureka mine, near Sproule's; U.S., in Jackson basin; Panama, in the mountains above Bear lake, and several others. In addition, there was considerable activity at the marble quarry, situated at Marblehead, eight miles from Lardo, which is at the north end of Kootenay lake; also, preparations were advanced toward providing another plant for dredging for placer gold on Lardo river, near Goldhill.

The Taylor hydraulic air compressor, put in on Coffee creek in the nineties, has been acquired by the Consolidated Mining and Smelting Co., which will use power from it in doing development work on several properties in the neighbourhood which it has under option of purchase. Water falling down a steel shaft forces air into storage tanks which provide sufficient pressure to admit of the air being used for power purposes. In former days of activity in Ainsworth camp air pipe lines were laid from the compressor to several mines and drills were operated by the power thus obtained.

**Slocan.**—The increasingly satisfactory development of the Surprise mine is reported, the opening of an important shoot of ore of good grade having been announced. Development work has been persisted in for years, despite many discouragements, and now it is stated that results justify all the confidence and outlay of the owners.

Recent developments in the Standard mine have shown the existence there of a large quantity of ore and of extensions of ore shoots beyond previously known limits of productiveness. The condition of the mine above No. 6 level is decidedly satisfactory, with much more known ore available for extraction than at any previous time in the history of the mine. Meanwhile No. 7 level is being advanced as quickly as possible, the purpose being to get under the ore shoot being worked in No. 6. To do this, however, will necessitate constant adit-driving for about four months longer. No. 7 is already in about 2,200 ft., but it will have to be driven between 1,000 and 2,000 ft. farther before the face will be under the productive zone in No. 6. One shoot of ore has already been passed through, but exploration of this ore body is being deferred so as not to risk interruption with the more important work of advancing the level to determine whether or not the ore shoot of so great value in and above No. 6 continues down to the level of No. 7.

In the Van Roi mine there is considerable improvement, the work of prospecting for more ore having been successful. The Van Roi concentrating plant is again being worked, and the expectation is that there will be a gradual increase in the output of ore and a corresponding enlargement of the production of silver, lead and zinc.

**Nelson Division.**—At the Silver King mine, the Dandy tunnel is being driven to connect with the main shaft of the King at the 800-ft. level, and it is expected the connection will be made by about the first of next year. Much work has been done recently in other parts of the group, chiefly in the direction of making the old workings safe for operating and developing ground not previously opened. No ore is being stoped, but that taken out in the course of development has been shipped to Trail. To the end of November about 3,000 tons had been shipped. The number of men working on this property is 70 to 75. The Consolidated Mining and Smelting Co. is at the head of this enterprise.

The British Columbia Copper Co. is working about 30 men at its Queen Victoria mine, situated about nine miles west of Nelson, near Beasley siding. Shipments of ore to the company's smelting works at Greenwood during eleven months to December 1 have aggregated about 25,000 tons. Latterly the output has been higher than during previous months, and it is expected that hereafter shipments will be maintained at from 2,500 to 3,000 tons a month. The property was purchased outright by the company about a year ago, and since then it has been worked continuously.

On the opposite side of Kootenay river, in the mountains a few miles to the southward, is situated the Eureka mine, which the British Columbia Copper Co. is developing under option of purchase. Some 27 men are employed and in the course of development work done several fair-looking bodies of ore have been opened. In past years a quantity of ore was shipped by those then operating the property, but under cost conditions that left little or no profit. The company now in possession has not attempted to ship ore in quantity, but has been giving its attention to development work, so as to determine whether or not the construction of an aerial tramway will be justified. An opportunity for securing a 3,000-ft. tramway at low cost having presented itself, advantage was taken of it, and the cables and other materials were stored at Granite, below the property. If it shall be decided to make provision for transporting ore to the railway, sites for main entries to the Eureka mine will first be determined, and thereafter construction of the tramway will be undertaken. Meanwhile further development work is being done, and ore shoots are being made accessible, so that production may be kept up after once commenced.

The Molly Gibson mine is distant from Nelson about 20 miles in an opposite direction to that of the Queen Victoria and Eureka. It is one of the properties of the Consolidated Mining and Smelting Co., which has been developing it at greater depth by driving a lower adit than that previously driven. Results have proved satisfactory, a shoot of silver-lead-zinc ore having been opened by this lower level. While not wide, this ore shoot is nearly continuous and the ore is of fairly high grade in silver and lead. The first-class ore is shipped as a crude product, while the second-class material is milled on the property and the resulting silver-lead concentrate is also sent to the company's smelting works at Trail. The high grade zinc middling is stored for treatment in the future, whenever conditions shall be favourable to its profitable utilization.

**Rossland.**—Dependable information concerning the condition of the Le Roi, Centre Star-War Eagle, and Josie groups of mines, is of most satisfactory nature. Reserves of ore in both Le Roi and Centre Star groups are larger than at any other time in recent years, and since value as well as quantity is good, prospects of the camp are decidedly gratifying. While the Le Roi No. 2 Co.'s Josie group has not had developed in its mines so large reserves of ore as have the others mentioned, the position is cheering, for ore shoots have been opened on various levels. At the deep levels, bodies of good ore have been found that promise well for later production. In the South Belt of the camp, the Richmond Consolidated Co. is crosscuting on the 200-ft. level of the Lily May mine. Employment is given to 25 men. Plant and buildings are in good condition and provide facilities for doing a large amount of work.

**Trail Creek Mining Division.**—The Canadian Pacific Railway Co. is reported to have announced an increase of ten cents a ton in the freight charge on ores in transit to the smelting works from places beyond Rossland shipping through that town to Trail. Heretofore the rate from Rossland to Trail on ore from outside mines has been 20 cents a ton; soon it will be 30 cents. The mines chiefly affected by the increase are several in Republic camp, Washington, shipping by the Great Northern Railway to Rossland, and there transferring to the Canadian Pacific Railway for the 12-mile haul thence down-hill to Trail.

**Trail**—Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail during the five weeks ended November 27, were as under:

| | Tons. | Tons. |
|---|---|---|
| **From East Kootenay—** | | |
| St. Eugene | 144 | |
| Society Girl | 20 | |
| Sullivan | 2,764 | |
| | | 2,928 |
| **From Ainsworth Division—** | | |
| Bluebell | 847 | |
| Cork | 5 | |
| Highland | 714 | |
| No. 1 | 352 | |
| Revenue | 16 | |
| Silver Hoard | 184 | |
| Utica | 82 | |
| | | 2,200 |
| **From Slocan Divisions—** | | |
| Eastmont | 59 | |
| Ottawa | 30 | |
| Rambler-Cariboo | 276 | |
| Slocan Star | 61 | |
| Standard | 1,053 | |
| Surprise | 54 | |
| Van-Roi | 32 | |
| | | 1,565 |
| **From Nelson Division—** | | |
| Emerald | 119 | |
| H. B. | 33 | |
| Molly Gibson | 160 | |
| Perrier | 6 | |
| Queen | 45 | |
| Second Relief | 39 | |
| Silver King | 1,192 | |
| Stewart | 5 | |
| | | 1,599 |
| **From Rossland—** | | |
| Centre Star group | 14,588 | |
| Josie | 2,062 | |
| Le Roi | 8,745 | |
| | | 25,395 |
| **From Lardeau—** | | |
| Ajax | | 37 |
| **From Boundary—** | | |
| Sally | | 20 |
| **From Kamloops—** | | |
| Iron Mask | | 232 |
| **From State of Washington—** | | |
| Ben Hur | 2,953 | |
| Bonanza | 140 | |
| Hope | 153 | |
| Imperator | 27 | |
| | | 3,273 |
| Total | | 30,626 |

## SIMILKAMEEN.

The directors of the Hedley Gold Mining Co. have decided to push on the construction work in connection with the new power system to be established on Similkameen river, below Hedley. The building of a dam across the river will be the first work undertaken, and excavations for this have already been made. The dam, which will be constructed diagonally across the river, will be 400 ft. in length; it will be of cement concrete, reinforced by a network of one-inch cable, of which the company has an ample supply, having for years been accumulating discarded cable from its long gravity tramway running part of the way between the 40-stamp mill at Hedley and the mines of Nickel Plate mountain.

## ROBB CORLISS ENGINES.

Those who have wanted to profit from the economy of a Corliss engine, but have hesitated to install this type because its speed is too low, especially for driving a generator direct-connected, must be interested in the Robb Corliss engine. With shorter stroke, much higher speed, positive operation of valves, and complete enclosure of moving parts this type overcomes every possible objection to the old forms of the well-known Corliss engine yet at no sacrifice to the usual advantages of this valve gear—almost perfect steam distribution, independent adjustment of the events of the stroke, small clearance, and separate cylinder ports for admission and exhaust which reduce cylinder condensation.

Successful operation at speeds from 90 to 225 revolutions per minute is the principal advantage resulting from the modified Corliss valve gear as used in the Robb engine. This high speed is made possible by simplifying the valve gear so as to eliminate all springs, dash pots, latches, cams, and disengaging parts. In fact, the Robb gear contains only about half the number of working parts necessary in the usual forms of Corliss valve gears.

In addition to the higher speed, the absence of these delicate parts means a smoother running engine and so little wear on the valve gear that steam economy and good regulation are maintained for years. The economy does not fall off rapidly after a short period of operation because the valve is not under the strain caused by the continual lifting of dash pots; and the valves cover the ports so firmly and seal them so tightly that there is no chance for leakage.

In other respects the engine is designed on the lines of modern heavy-duty Corliss engines. A relatively short stroke and compact substantial frame overcome the vibration always found in the long-stroke girder-frame design. The reciprocating parts are carefully balanced.

Full pressure of steam comes very quickly into the cylinder of the engine because of the triple port opening through the admission valves; and there is free exit through the exhaust valves at the proper time because of the double port opening. The steam pressure is well taken care of by the large surfaces of the valves which are nearly balanced by carrying the metal around the top, resulting in a long life and a minimum wear of valves and seats.

Accurate machining of the ports is possible because in this type of engine the valve seats are separate bushes, which are machined before being put in place, and these renewable cast-iron linings are made of closer grained cast-iron than the cylinder castings which makes them wear very much longer. Also the valves and ports are so machined that they register accurately with each other.

A valve action that does not depend upon a releasing gear for quick opening and closing is the distinct feature of the engine. But the motion imparted to the valves is identical with that of drop cut-off gears which pick up the lifting arms then drop them. Two small links between the wrist plate and bell crank do away with springs, dash pots, latches, and cams, making a positively-driven valve gear which may be operated at high speed.

## A LARGE ELECTRIC HOIST.

During the first week of November the directors of the North Butte Mining Company, in a meeting at Duluth, voted to award to the Westinghouse Electric & Manufacturing Company, the contract for what will be the largest electric hoist in the two American continents, and one of the largest of its kind in the world. The hoisting drums, which will be 12 ft. in diameter, will be driven by a direct connected electric motor running at a speed of about 71 revolutions per minute. Power will be supplied to this motor from a motor generator set equipped with a 50-ton flywheel to secure elimination of the peaks that would be drawn from the power line during period of starting and acceleration.

Hoisting with this equipment will be done in balance, but the equipment is large enough to take care of unbalanced hoistings. Skips will be used for handling the ore and each skip will have a capacity of 7 tons of ore. Round rope 1⅝-in. in diameter will be used and the equipment is designed for a normal rope speed of 2,700 ft. per minute with a maximum of 3,000 ft. per minute. The capacity of the hoist will permit 300 tons per hour being hoisted from the 2,000 ft. level or 200 tons per hour from the 4,000 ft. level.

The system of control and power equalization used will be that commonly known as the Ilgner System, in which a flywheel driven by the motor generator set is permitted to give up some of its stored energy to supply the peak load drawn by the hoisting motor. In order to reduce the flywheel losses to a minimum, the flywheel will be encased in a smoothly finished steel housing and provided with special type of self-lubricating bearings.

The hoisting motor will be of the type used in steel mills and will be of a very heavy construction. In fact, all of the equipment has been designed with absolute reliability as the paramount consideration. The electrical equipment alone will weigh in excess of 250 tons. A number of special safety devices are included in the equipment, including electrically released brakes; automatic slow-down devices to prevent skip or cage ever going through head sheaves and a special controller to limit the speed when hoisting men.

The hoist motor will have a maximum intermittent rating of 4,500 h.p. and the motor generator set will be driven by an induction motor having a continuous normal rating of 1,400 h.p. The difference between these ratings represents approximately the amount of energy that will be supplied by the flywheel momentarily during starting. The installation is so designed that the draft of power from the power line will be practically constant throughout any cycle of hoisting.

This Granite Mountain Hoist of the North Butte Mining Company will be the largest electric hoist anywhere in the Western Hemisphere, and will be one of the largest using the Ilgner System of power equalization installed anywhere in the world. There are larger electric hoists in South Africa, a few of which use the Ilgner system of power equalization, but most of these South African hoists do not attempt to obtain power equalization.

## HOLLINGER.

The report of Hollinger Gold Mines, Ltd., for four weeks ending November 4, 1913, says, in part:

Gross profits for the four weeks amounted to \$124,-995.11. There was hoisted 13,210 tons ore, and 1,153 tons waste rock. The average value of the ore hoisted was \$15.04 per ton. The total cost of mining was \$5,055 per ton

The mill ran 95 per cent. of the possible running time, treating 13,401 tons, of which 310 tons were treated for the Acme Gold Mines, Limited. The average value of Hollinger ore treated was \$15.07 per ton; approximate extraction 96.1 per cent.; milling cost \$1,407 per ton.

The total cost of \$5.05 per ton shows a reduction from previous results. It is well for shareholders to remember that this cost includes all development, shaft sinking, timbering and other dead work. If this development cost were carried as a deferred charge to be distributed over all ore developed or made available, the total working cost would be reduced by some 70 or 80 cents. That is to say, our actual cost for mining, milling and general charges amounts to about \$4.25 per ton, but we consider it advisable at present to burden operations with the cost of work from which future benefits will be derived.

Satisfactory developments have continued in the mine. Drifting has amounted to 484 ft. The winze below the 425-ft. level had reached a depth of 22 ft. upon November 4th. The vein is 8 ft. wide and carries \$17.00 per ton at the bottom of the winze.

## COBALT ORE SHIPMENTS.

The bullion shipments for the week ending Dec. 5th were:

| | Bars | Ounces | Value |
|---|---|---|---|
| Nipissing | 140 | 165,651.73 | \$96,192.15 |
| Townsite | 14 | 10,780.00 | 6,144.00 |
| Penn. Can. | 10 | 8,096.00 | 4,695.00 |
| | 164 | 184,527.73 | \$107,331.15 |

The ore shipments for the week ending Dec. 12 were:

| | High. | Low. | Pounds. |
|---|---|---|---|
| La Rose | 68,000 | 100,000 | 168,000 |
| McKinley-Darragh | 60,810 | ....... | 60,810 |
| Beaver | 109,780 | ....... | 109,780 |
| Timiskaming | 87,220 | ....... | 87,220 |
| O'Brien | 82,210 | ....... | 82,210 |
| Cobalt Townsite | 82,810 | ....... | 82,810 |
| Right of Way | 86,800 | ....... | 86,800 |
| Cobalt Comet | 66,200 | ....... | 66,200 |
| Penn. Canadian | 65,580 | ....... | 65,580 |
| | 709,410 | 100,000 | 809,410 |

The bullion shipments for the week ending Dec. 12 were:

| | Bars. | Ounces. | Value. |
|---|---|---|---|
| Nipissing | 112 | 131,850.79 | \$76,903.08 |
| Dom. Reduction | 62 | 70,112.00 | 42,600.00 |
| Crown Reserve | 58 | 65,189.00 | 37,809.00 |
| | 232 | 267,161.79 | \$157,212.08 |

# MARKETS

### STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.). December 8, 1913.

**New York Curb.**

| | Bid. | Ask. |
|---|---|---|
| Alaska Gold | 21.00 | 21.50 |
| British Copper | 2.12 | 2.37 |
| Braden Copper | 7.37 | 7.50 |
| California Oil | 220.00 | 222.00 |
| Chino Copper | 37.50 | 38.00 |
| Giroux Copper | .75 | 1.25 |
| Green Can. | 6.00 | 7.00 |
| Granby | .... | .... |
| Miami Copper | 21.37 | 21.87 |
| Nevada Copper | 14.87 | 15.00 |
| Ohio Oil | 138.00 | 140.00 |
| Ray Cons. Copper | 18.00 | 18.12 |
| Standard Oil of N. Y. | 170.00 | 171.00 |
| Standard Oil of N. J. | 397.00 | 399.00 |
| Standard Oil, (old) | 1185.00 | 1210.00 |
| Standard Oil (subs) | 785.00 | 800.00 |
| Tonopah Mining | 5.50 | 6.00 |
| Tonopah Belmont | 7.62 | 7.75 |
| Tonopah Merger | .56 | .58 |
| Inspiration Copper | 14.12 | 14.62 |
| Gold Field Cons. | 1.43 | 1.56 |
| Yukon Gold | 2.00 | 2.12 |

| Porcupine Stocks. | Bid. | Ask. |
|---|---|---|
| Apex | .00¾ | .01¼ |
| Dome Extension | .06½ | .07 |
| Dome Lake | .27½ | .28 |
| Dome Mines | 18.00 | 18.25 |
| Eldorado | .... | .01 |
| Foley O'Brien | .17 | .20 |
| Hollinger | 17.25 | 17.75 |
| Jupiter | .06 | .06½ |
| McIntyre | 1.90 | 2.00 |
| Moneta | .02 | .04 |
| North Dome | .... | .40 |
| Northern Exploration | 1.00 | 1.25 |
| Pearl Lake | .09½ | .09¾ |
| Plenaurum | .... | .50 |
| Porcupine Gold | .14½ | .15 |
| Imperial | .01 | .02 |
| Porcupine Reserve | .... | .06 |
| Preston East Dome | .01 | .02 |
| Rea | .12 | .16 |
| Standard | .... | .01 |
| Swastika | .02½ | .03 |
| United | .... | .01 |
| West Dome | .05 | .10 |
| Porcupine Crown | 1.23 | 1.26 |
| Teck Hughes | .26 | .30 |
| Caribou Cobalt | .57 | .61 |

| Cobalt Stocks. | Bid. | Ask. |
|---|---|---|
| Bailey | .05¾ | .06 |
| Beaver | .29½ | .30 |
| Buffalo | 2.00 | 2.03 |
| Canadian | .... | .15 |
| Chambers Ferland | .16¼ | .16½ |
| City of Cobalt | .30 | .35 |
| Cobalt Lake | .53 | .60 |
| Coniagas | 7.00 | 7.50 |
| Crown Reserve | 1.76 | 1.78 |
| Foster | .06 | .07 |
| Gifford | .03½ | .04 |
| Gould | .03 | .03⅛ |
| Great Northern | .10½ | .10¾ |
| Hargraves | .03 | .04 |
| Hudson Bay | 75.00 | 79.00 |
| Kerr Lake | 4.45 | 4.50 |
| La Rose | 1.95 | 2.00 |
| McKinley | 1.23 | 1.26 |
| Nipissing | 8.00 | 8.10 |
| Peterson Lake | .26 | .26¼ |
| Right of Way | .04½ | .05 |
| Rochester | .02 | .03 |
| Leaf | .01¾ | .02 |
| Cochrane | .... | .40 |
| Silver Queen | .... | .05 |
| Timiskaming | .14 | .14½ |
| Trethewey | .25 | .26 |
| Wettlaufer | .07 | .09 |
| Seneca Superior | 2.00 | 3.00 |

### TORONTO MARKETS.

Dec. 10.—(Quotations from Canada Metal Co., Toronto).
Spelter, 5 cents per pound.
Lead, 5½ cents per pound.
Tin, 41½ cents per pound.
Antimony, 8½ cents per pound.
Copper, casting, 15½ cents per pound.
Electrolytic, 15½ cents per pound.
Ingot brass, 10 to 15 cents per pound.

Dec. 9.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).

Dec. 9.—Coal—(Quotations from Elias Rogers Co., Toronto).
Anthracite, $8.25 per ton.
Bituminous, lump, $5.25 per ton.

### GENERAL MARKETS.

Dec. 8.—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $1.75 to $1.85 per ton.
Foundry coke, prompt, $2.50 to $2.75 per ton.

Dec. 8.—Tin, straits, 37.70 cents.
Copper, Prime Lake, 14.50 to 14.75 cents.
Electrolytic Copper, 14.25 to 14.50 cents.
Copper wire, 15.50 to 15.75 cents.
Lead, 4.10 cents.
Spelter, 5.12½ to 5.25 cents.
Sheet zinc (f.o.b. smelter), 7.25 cents.
Antimony, Cookson's, 7.40 to 7.50 cents.
Aluminum, 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, $43.00 to $44.00 per ounce.
Platinum, hard, 10 per cent., $46.00 to $47.50 per ounce.
Platinum, hard, 20 per cent., $49.00 to $51.50 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $38.00 per 75-lb. flask.

### SILVER PRICES.

| | New York cents. | London pence. |
|---|---|---|
| Nov. 25 | 58½ | 27 1/16 |
| " 26 | 58⅜ | 27 |
| " 27 | .. | 26¾ |
| " 28 | 57⅞ | 26¾ |
| " 29 | 57⅛ | 26 7/16 |
| Dec. 1 | 56⅛ | 25 15/16 |
| " 2 | 57⅜ | 26½ |
| " 3 | 57⅝ | 26⅝ |
| " 4 | 57¾ | 26 11/16 |
| " 5 | 58⅜ | 27 |
| " 6 | 58⅞ | 27¼ |
| " 8 | 58½ | 27 1/16 |
| " 9 | 58¼ | 26 15/16 |
| " 10 | 57⅞ | 26¾ |

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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CONTINUED FROM PRECEDING PAGE.

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## ALPHABETICAL INDEX TO ADVERTISERS

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Canadian Ingersoll-Rand Co., Ltd.

**Coal Washeries—**
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.
Head, Wrightson & Co., Ltd.

**Compressors—Air—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Canadian Allis-Chalmers, Ltd.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Cleveland Pneumatic Tool Co. of Canada, Ltd.
Mussens, Limited.
Peacock Brothers.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Concentrators and Jigs.**
Canadian Allis-Chalmers, Ltd.
Diester Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
James Ore Concentrator Co.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Canadian Fairbanks-Morse Co.

**Concrete Mixers—**
Canadian Allis-Chalmers, Ltd.
Peacocks Brothers.
Mussens, Limited.
Northern Canada Supply Co.

**Condensers—**
Canadian Allis-Chalmers, Ltd.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Converters—**
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Mussens, Limited.

**Conveyors—Belt—**
Head, Wrightson & Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
Peacock Brothers.
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

**Cranes—**
SmartTurner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbanks-Morse Co., Ltd.
M. Beatty & Sons, Ltd.
Krupp, Fried. A. G., Germany.

**Crane Ropes—**
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

**Crushers—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Jenckes Machine Co.
Peacock Brothers.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.

**Cyanide Plants—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Peacock Brothers.

**Derricks—**
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

**Diamond Drill Contractors—**
Diamond Drill Contracting Co.
Smith & Travers.

**Dredging Machinery—**
Canadian Allis-Chalmers, Ltd.
Peacock Brothers.
M. Beatty & Sons.
Mussens, Limited.

**Dredging Ropes—**
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**
Canadian Allis-Chalmers, Ltd.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Northern Canada Supply Co.

**Drills—Core—**
Can. Ingersoll-Rand Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Standard Diamond Drill Co.

**Drills—Diamond.**
American Diamond Rock Drills.
Sulivan Machinery Co.
Northern Canada Supply Co.

**Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Northern Canada Supply Co.

**Drills—Electric—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Siemens Co. of Can., Ltd.
Canadian Ingersoll-Rand Co.

**Dump Cars—**
Sullivan Machinery Co.
Waterous Engine Works Co.
Mussens, Limited.
Orenstein-Arthur Koppel Co.

**Dynamite—**
Curtis & Harvey (Canada). Limited.
Canadian Explosives.
Northern Canada Supply Co.

**Dynamos—**
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.

**Ejectors—**
Mussens, Limited.
Peacock Brothers.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Elevators—**
Canadian Allis-Chalmers, Ltd.
Jeffrey Mfg. Co.
Krupp, Fried. A. G., Germany.
M. Beatty & Sons.
Sullivan Machinery Co.
Northern Canada Supply Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Peacock Brothers.

**Engineering Instruments—**
C. L. Berger & Sons.
Peacock Brothers.

**Engineers and Contractors—**
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Roberts & Schaefer Co.
Head, Wrightson & Co, Ltd.

**Engines—Automatic—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
Waterous Engine Works Co.
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Mussens, Limited.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
M. Beatty & Sons.
Canadian Westinghouse.
John Inglis & Co., Ltd.
Can. Fairbanks-Morse Co.

**Engine—Haulage—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jenckes Machine Co.

**Engines—Marine—**
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Brothers.
The John Englis Co., Ltd.
Can. Fairbanks-Morse Co.

**Engines—Oil—**
Jenckes Machine Co.
Peacock Brothers.
Can. Fairbanks-Morse Co.

**Engines—Steam—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Smart-Turner Mahine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.

**Fans—Ventilating—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Peacock Brothers.
Mussens, Limited.

**Feeders—Ore—**
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried, A. G., Germany.
Mussens, Limited.

**Filters—**
Krupp, Fried, A. G., Germany.

**Forges—**
Mussens, Limited.
**Can. Fairbanks-Morse Co.**
Northern Canada Supply Co. Ltd.

**Forgings—**
M. Beatty & Sons.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.

**Furnaces—Assay—**
Krupp, Fried, A. G., Germany.
Lymans, Limited.
Mussens, Limited.

**Fuse—**
Peacock Brothers.
Curtis & Harvey, (Canada). Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Northern Canada Supply Co.

**Gears—**
Canadian Westinghouse.
Krupp, Fried, A. G., Germany.
Smart-Turner Machine Co.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

**Generators—**
Canadian Westinghouse.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada., Ltd.

**Girders—Steel—**
Dominion Bridge Co.

Continued on page 36.

## Canadian Miner's Buying Directory.—(Continued from page 34.)

**Hangers—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Heaters—Feed Water—**
Mussens, Limited.
Laurie & Lamb.
Canadian Westinghouse.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**
Mussens, Limited.
Northern Canada Supply Co.

**Hoists—Air, Electric and Steam—**
Can. Ingersoll-Rand Co. Ltd
Peacock Brothers.
Krupp, Fried, A. G., Germany.
Mussens Limited.
Canadian Allis-Chalmers, Ltd.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co. Ltd.
M. Beatty & Sons.
Can. Fairbanks-Morse Co.
Fraser & Chalmers Ltd.
Northern Canada Supply Co.

**Hoisting Engines—**
Canadian Allis-Chalmers, Ltd.
Mussens, Limited.
Peacock Brothers.
Can. Fairbanks-Morse Co.
Siemens Co. of Canada, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**
Mussens, Limited.
Waterous Engine Works.

**Hose—**
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.
Northern Canada Supply Co.

**Jacks—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

**Jigs—**
Krupp, Fried, A. G., Germany.
Mussens, Limited.
Canadian Allis-Chalmers, Ltd.
Jenckes Machine Co.
Roberts & Schaefer Co.

**Lamps—Acetylene—**
Mussens, Limited.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Lamps—Safety—**
Canadian Explosives.
John Davis & Son.
Peacock Brothers.
Ackroyd & Best.
Siemens Co. of Canada, Ltd.

**Link Belt—**
Waterous Engine Works.
Northern Canada Supply Co.
Jones & Glassco.

**Locomotives—electric—**
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Co. of Can., Ltd.

**Locomotives—Steam—**
Mussens, Limited.
Canadian Westinghouse.

**Metal Merchants—**
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.

**Monel Metal—**
Orford Copper Co.

**Motors—**
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Ore Sacks—**
Can. Bag Co.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

**Ore Testing Works—**
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

**Ores and Metals—Buyers and Sellers of—**
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Krupp, Fried, A. G., Germany.
Orford Copper Co.
Canada Metal Co.

**Perforated Metals—**
B. Greening Wire Co., Ltd.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pick Machines—**
Sullivan Machinery Co.

**Picks—Steel—**
Mussens, Limited.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Peacock Brothers.

**Pipes—Rivetted—**
Consolidated Mining & Smelting Co.
Peacock Brothers.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

**Pipe Fittings—**
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.
Northern Canada Supply Co.

**Pneumatic Tools—**
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

**Producer—Gas—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.

**Prospecting Mills and Machinery—**
Standard Diamond Drill Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hangings—**
Smart-Turner Machine Co.
Krupp, Fried. A.G., Germany.
Fraser & Chalmers, Ltd.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
Northern Canada Supply Co.
Peacock Brothers.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**
Canadian Allis-Chalmers, Ltd.
Can. Fairbanks-Morse Co.
Alex. Fleck.
Mussens, Limited.
Smart-Turner Machine Co.
Peacock Brothers.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Electric—**
Can. Fairbanks-Morse Co.
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Pneumotic—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rrand Co.

**Pumps—Sinking—**
Can. Fairbanks-Morse Co.
Mussens, Limited.
Can. Ingersoll-Rand Co.

**Pumps—Steam—**
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Thos. & Wm. Smith.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.
The John Inglis Co., Ltd.

**Pumps—Turbine—**
Krupp, Fried. A.G., Germany.
Mussens, Limited.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Pumps—Vacuum—**
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Can. Cleveland Drill Co.
Krupp, Fried. A.G., Germany.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**
Can. Allis-Chalmers, Ltd.
Fraser & Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Rolling Mill Machinery—**
Krupp, Fried. A. G., Germany.

**Rolls—Crushing—**
Mussens, Limited.
Krupp, Fried. A. G., Germany.
Fraser & Chalmers, Ltd.
Canadian Allis-Chalmers, Ltd

**Roofing—**
Patterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Northern Canada Supply Co.
Can. H. W. Johns-Manville Co.
Head, Wrightson & Co., Ltd

**Rope—Manilla and Jute—**
Jones & Glassco.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**
B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers, Ltd.

**Samplers—**
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Krupp, Fried. A. G., Germany.
Thos. Hays & Sons.

**Screens—**
Mussens, Limited.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Northern Canada Supply Co.
B. Greening Wire Co.
Can. Allis-Chalmers, Ltd.
Peacock Bros.
Waterous Engine Co.
Fraser & Chalmers, Ltd.

**Separators—**
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Smart-Turner Machine Co.
Peacock Brothers.
The John Inglis Co., Ltd.

**Separators—Magnetic—**
Krupp, Fried. A. G., Germany.

**Shavels—Steam—**
Mussens, Limited.
M. Beatty & Sons.

**Slime Tables—**
Diester Concentrator Co.
James Ore Concentrator.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.

**Smelting Machinery—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Krupp, Fried. A. G., Germany.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Stamp Mills—**
Krupp, Fried. A. G., Germany.
Mussens, Limited.
Can. Allis-Chalmers.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Bros.
Fraser & Chalmers, Ltd.

**Steel Drill—**
Sullivan Machinery Co.
Northern Canada Supply Co.
Krupp, Fried. A. G., Germany.
Canadian Ingersoll-Rand Co. Ltd.
Peacock Brothers.

**Steel—Tool—**
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Krupp, Fried. A. G., Germany.
N. S. Steel & Coal Co.

**Surveying Instruments—**
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
John Davis & Son.

**Switchboards—**
Canadian Westinghouse.
Can. Allis-Chalmers, Ltd.
Siemens Co. of Can., Ltd.

**Tanks—Cyanide, Etc.—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
Peacock Bros.
Fraser & Chalmers, Ltd.
The John Inglis Co., Ltd.

**Terminals—Cable—**
Standard Underground Cable Co. of Canada, Ltd.

**Tramways—**
Mussens, Limited.
B. Greening Wire Co.
Can. Allis-Chalmers Ltd
Jenckes Machine Co.

**Transformers—**
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Co. of Can., Ltd.

**Transits—**
C. L. Berger & Sons.
W. F. Stanley.
John Davis & Sons.
Peacock Brothers.

**Tractors—Oil—**
Canadian Fairbanks-Morse Co., Ltd.

**Tube Mills—**
Mussens, Limited.
Krupp, Fried. A. G., Germany,
Can. Allis-Chalmers, Ltd.
Peacock Brothers.
Fraser & Chalmers, Ltd.

**Turbines—**
Canadian Westinghouse.
Peacock Brothers.
Laurie & Lamb.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Siemens Co. of Can., Ltd.
Krupp, Fried. A. G., Germany,
Fraser & Chalmers, Ltd.
International Engineering Works, Ltd.

**Water Wheels—**
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Krupp, Fried. A. G., Germany.

**Winding Engines—**
Waterous Engine Works.
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser Chalmers, Ltd.
Siemens Co. of Can., Ltd.

**Wire Cloth—**
Can. Allis-Chalmers, Ltd.
Mussens, Limited.
Northern Canada Supply Co.
B. Greening Wire Co.

**Wire (Bare and Insulated)—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Magnet—**
Standard Underground Cable Co. of Canada, Ltd.

**Wire—Railway, Feeder and Trolley—**
Standard Underground Cable Co. of Canada, Ltd.

**Zinc Dust—**
Roessler & Hasslacher.

*Lindgren*—

# MINERAL DEPOSITS


By WALDEMAR LINDGREN, Professor of Economic Geology, in in charge of the Department of Geology, Massachusetts Institute of Technology; Geologist, United States Geological Survey.

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## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $72,194,603; Lode Gold, $70,859,022; Silver, $33,863,940; Lead, $27,520,753; Copper, $73,723,562; Other Metals (Zinc, Iron, etc.), $1,528,403; Coal and Coke, $132,871,155; Building Stone, Brick, etc., $17,576,084; making its Mineral Production to the end of 1912 show an

## Aggregate Value of $430,137,522

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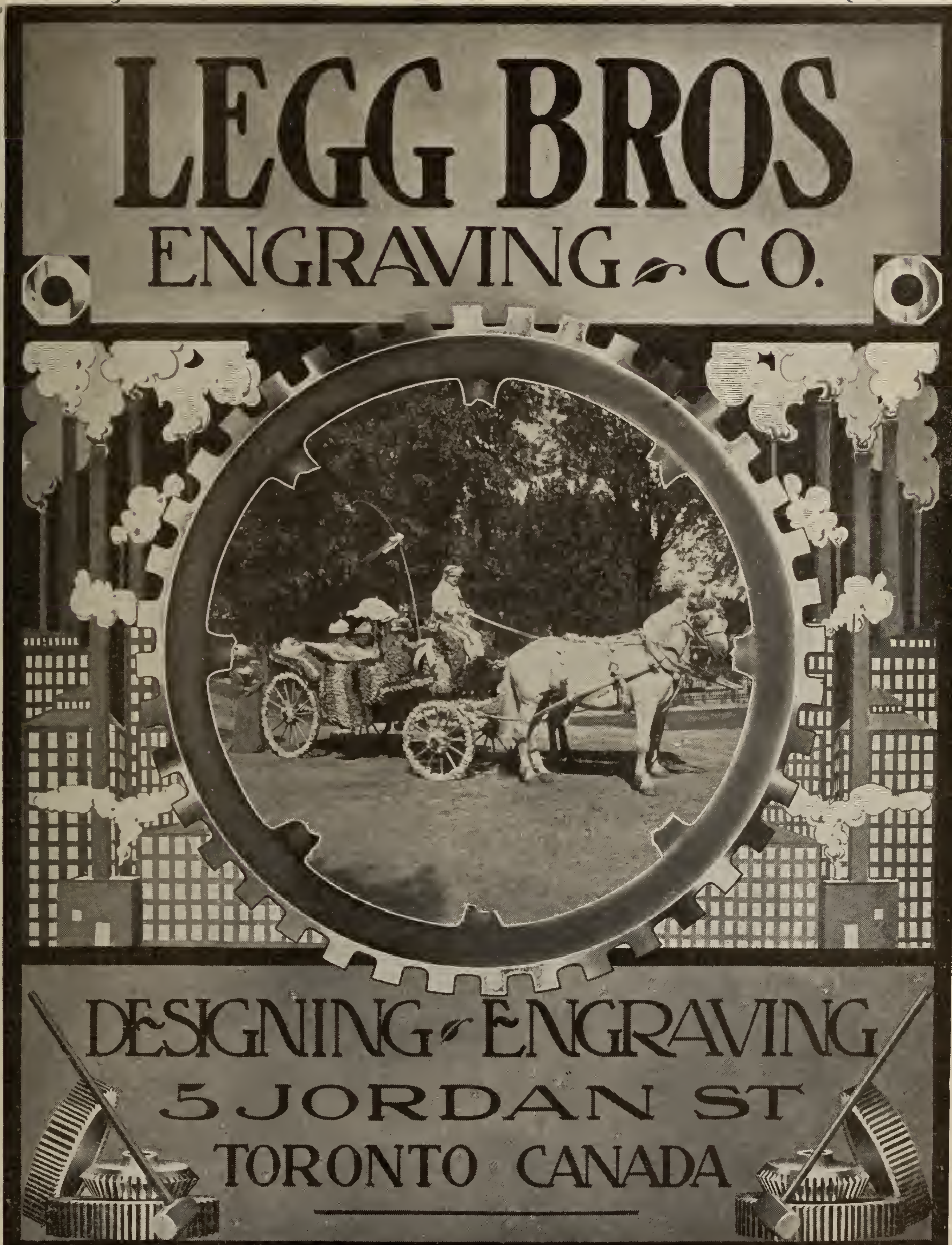
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